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The Philippine Agricultural Review

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EDITORIAL.

COLLEGE OF VETERINARY SCIENCE.

The article on the College of Veterinary Science, University of the Philippines, by Dr. Alvin Broerman, appearing elsewhere in this issue, comprises an announcement of the inauguration of an educational force of high importance to the development

of the Philippines. The prosperity of the Islands rests upon agriculture and agriculture in turn is dependent upon the existence of an abundant supply of work animals. In the Philippines, more than in temperate zones, is it necessary to safeguard the health of animals by a corps of veterinarians highly trained in the methods of preventing the dissemination of the infectious diseases of live stock.

It is an interesting fact that the ravages of rinderpest in western Europe in the latter half of the eighteenth century awakened the public to the necessity of state supported veterinary schools as a means of preparing trained men, properly to combat this cattle plague. A similar incentive has operated in the Philippines to establish what undoubtedly is the youngest of the state supported veterinary colleges. The hopes of the founders of the first veterinary college were realized by the utter extinction of the disease; the confidence in public education as a weapon against disease, cherished by the founders of the last veterinary college, is not misplaced.

The college opens a practicable way for Filipinos to secure adequate preparation to participate in this work of far-reaching importance. At present there is no graduate Filipino veterinarian in the Islands, although it is expected that one will return shortly from the United States with such a professional training.

The lack of properly educated Filipino veterinarians constitutes a weak point in the attack against existing disease. The present campaign is being directed by Americans, whose mode of thought and customs are as widely different from those of the people with whom they are dealing, as the East is from the West. Furthermore, the fact must be taken into consideration that they are separated from conversation with the great mass of stock owners by a chasm that frequently must be bridged by transmission of ideas through two or three languages.

Education of the individual stock owner as to precautions to be taken by himself ought to be made a potent factor in at least reducing losses from disease. In entirely analogous cases elsewhere, pests of agriculture have been by this means reduced to comparative harmlessness. Such individual action springing from knowledge of the facts governing the dissemination of disease, would create a situation favoring the prompt success of systematic measures of eradication instituted by the Government. It is with the hope of expediting popular education in matters of animal diseases and smoothing over the difficulties of disease eradication by developing trained Filipinos that the college is operated.

•

The College of Veterinary Science is aspiring to a standard of thoroughness of instruction that should justify its classification, in this particular, with the best veterinary colleges in Europe or America. In its requirement of attendance for five years of nine months each it immeasurably distances the standards of many institutions in the United States. Allowing for the fact that the first year of the five years may be regarded as preparatory, it may be classified as a four-year veterinary college, requiring a full high-school course for entrance, a standard by no means generally maintained in the United States.

During the first three years of the course the only subject taken at the buildings of the College of Veterinary Science is veterinary anatomy, the remainder of the time being spent in taking courses with medical students at the College of Medicine and Surgery, or special courses suited to the needs of veterinarians. This college of the university is, in equipment, faculty, and standards, easily in the front rank of medical schools. The close affiliation of veterinary and medical students enables the former to enjoy facilities for instruction rare, in any country.

MONTHLY SUMMARY OF CROP CONDITIONS.

Executive Order No. 13, and Bureau of Agriculture Form No. 38, published in this number of the REVIEW, provide for a monthly summary of crop conditions, to be furnished by the governor of each province. A summary of these reports will be furnished the daily press in Manila and the provinces, will be sent to the Bureau of Insular Affairs in Washington, and will be published in the PHILIPPINE AGRICULTURAL REVIEW. The original reports will be on file at the office of the Bureau of Agriculture, and will be available for use by any person interested in provincial conditions.

The object of a monthly provincial crop report is to furnish the general public, and more particularly industrial and commercial interests, with up-to-date information pertaining to agricultural conditions throughout the Islands. Quarterly statistical crop reports and semiannual statistical live-stock reports are valuable as a basis for the compilation of agricultural statistics, but they do not furnish certain current information for which there is a widespread demand, and which will be covered by the monthly reports. The blank forms for these reports are being distributed as this number of the REVIEW goes to press.

THE DEVELOPMENT OF PHILIPPINE AGRICULTURE.¹

By C. V. PIPER,

Agrostologist, United States Department of Agriculture.

It is with peculiar pleasure that I welcome the opportunity to address you to-day, you who represent the highest type of Filipino agriculturists. I can not of course speak with any intimate knowledge of your agricultural conditions and must therefore confine myself to certain general propositions connected with the development of your agriculture.

For the past eight years we of the United States Department of Agriculture have been watching the agricultural work here with much interest. Everyone who has returned to America has spoken in glowing terms of the great agricultural possibilities of the Philippines and has predicted that some day the agricultural output of the Islands would be a revelation to the world. One thing at least seems perfectly clear and that is that the prosperity and attendant progress of the Philippine Islands must come almost wholly from the soil. If this be true it follows that the highest duty of the Government is to stimulate agricultural development as rapidly as possible. Along with such development will come all other blessings and it is the only way to secure them.

This truth is elementary and fundamental, yet many fail to grasp it. No country in all history has ever reached a high status except on the foundation of a prosperous agriculture and no country that has allowed its agriculture to dwindle has long survived its decadence.

It is the recognition of this fundamental truth that has made the people of the United States so liberal and enthusiastic in all matters pertaining to agricultural progress. In no other country in the world is the farmer held in so high public estimation. The American recognizes clearly that the value of everything

¹ Address delivered at the agricultural conferences held in Manila from February 21 to 24, 1911. .

else depends on the crops, and therefore more and more effort is being spent to assure their certainty and abundance.

The history of the development of agricultural research and of agricultural education in the United States, and the methods both have come to employ in the process of their evolution is worthy of the most careful consideration in determining the wisest course to be pursued here. That great progress has been made in America is beyond question. Nobody to-day denies it or even has any doubts on the subject. We have made mistakes of course, but most of these can in the light of American experience be avoided in the Philippines. After twenty-five years of agricultural research and agricultural education in the United States, we feel that we are just beginning to reap the greatest rewards from the work, and we look forward to the future progress being much more rapid than the past. That the crops of the United States can be doubled no one doubts, and but few question that they can be quadrupled. Optimists say they can be increased at least tenfold. Whatever the possibilities may be it is the high mission of agricultural research and agricultural education to develop them to the uttermost. If such possibilities still remain in American agriculture, think how great they are in these beautiful Islands where only one-fifteenth of your arable lands are in cultivation and most of that only for one-half of the year. I want to repeat that it is only by developing these enormous latent resources that the Filipino people can become rich and powerful. And this can by no possibility be brought about by some political *hocus pocus* as some dreamers profess to believe.

It is, I think, a very wise arrangement in the Insular Government that so closely allies agriculture and education. It assures unity of purpose and coöperation of effort. There are, however, some pitfalls to avoid. First of all you can't teach agriculture till you have it to teach. In the United States we now have twenty-five years' results in experimentation and a vast amount from other countries with comparable conditions. In the Tropics, agriculture is still in its infancy. It is true that the principles of agriculture are the same the world over, but such principles are general, and the man who is growing rice or sugar or tobacco or what not wants specific information. If he follows any advice or teaching he has a right to expect that his returns per acre will be increased or the cost per acre reduced. If such results do not follow he has a just grievance and your work becomes discredited.

There are just two ways in which definite knowledge con-

cerning any crop can be obtained, namely, experience and experimentation; on the one hand the results of the farmer, on the other of the scientific investigator.

It is no criticism of the Bureau of Agriculture to say that the experimental data on crops thus far secured is far too meager for educational purposes. At the outset the Bureau has devoted the bulk of its energies to the eradication of animal diseases. I think that under the conditions presented there can be little question as to the wisdom of this policy, as at the present time successful agriculture in the Philippines is largely dependent on farm animals. It therefore happens that as yet but little has been done in an experimental way to bring about the betterment of Philippine crops. It is unfortunate that ample funds were not provided so that experimental work with crops could proceed at the same time that the animal diseases were being brought under control.

In the meantime agricultural education has been introduced in all the schools and the teacher is struggling as best he can with a problem by no means simple or easy. It is the same problem that had to be solved in the United States. The success that has attended its solution there is ample proof that it was a wise movement, and in due time equal success will be attained here.

I have before said that there were two ways of securing knowledge about crops—one by experiment, the other by experience. It is only in late years that the value of the farmer's experience has been properly appreciated. Everywhere there are good farmers, bad farmers, and indifferent farmers. A careful study of the methods employed by each, and the results they obtain, frequently discloses the fact that they have solved problems of importance in the course of their experience. Such studies are being conducted in the United States more than ever before. In fact it is becoming to be regarded as fundamental to experimental work. One must know the different methods that farmers employ and the results that each secures, before he can really discern where the real problems lie. I mention this apparently obvious thing because it is almost the latest phase of agricultural study. I believe it will be found to apply here just as in the United States. Take the rice crop for instance. It is doubtless the case in the Philippines that the methods of handling the crop vary with the locality. Which of these methods is best? It will not do to assume that the local method must be best. It may be merely the result of crystallized tradition, but often a local method has some good reason for its use.

On the other hand it would be dangerous to assume that the method employed in South Carolina or Texas or Japan is superior. The wise thing to do is to study the different methods carefully and corollate them as far as possible with the results obtained. With this as a basis, critical experiments can be conducted to determine which is best. The important point is not to experiment until the native methods have been studied, and most important of all not to attempt demonstration work until there is an ample body of experimental proof of its correctness.

There are I am told 500 varieties of rice in the Philippine Islands. It goes without saying that some of these are better than others, but it is evident that a great amount of experimental work must be done before the very best can be determined. There is furthermore the chance that certain foreign sorts may be superior. It would be a mistake to endeavor to supplant a local variety until the evidence was ample that it really was inferior in yield or quality or both. Where a superior sort can be introduced it often means a large increase in yield and that without additional labor or cost to the farmer. The importance of such experimental work is therefore evident, and it is also clear that it requires time to secure reliable results.

I can not too strongly impress upon your minds that experimental work with crops is fundamental to agricultural progress, and such work can rarely be completed in less than five years' time. I mention this because in the early experience of American experiment stations there was an insistent public demand for immediate results. The effect of this too often led to the neglect of the most important problems, as these require time as well as ample facilities for their solution. The recognition of this fact will do much to further agricultural progress in these Islands, while on the other hand a demand for immediate results will lead to much premature publication and consequent harm.

I do not mean to imply that there is not a great deal that can be done at once on the basis of investigations that have been made elsewhere. This is certainly true of such crops as sugar, tobacco, coconuts, fruits, etc. I do mean, however, that it is necessary to repeat the experimental work that has been done elsewhere as well as to supplement it with investigations that pertain peculiarly to your conditions. As long as you keep your foundation on experimental work there can be no question as to progress, and any other method invites disaster.

Until late years there existed in the United States a gap between the work of the investigator and the work of the teacher

in agriculture. One was learning valuable things by investigations and experiments and the other was teaching them to his students, but after all only a little of this reached the farmer. This has been now corrected by the adoption of coöperative experiments with the best farmers and of demonstrations with the poorer farmers. After all most of us have to be shown that a certain thing is true before we will believe it, and I do not for one moment blame a farmer for not taking up every new thing proposed. If, however, you can convince him by a demonstration or experiment on his own farm that a certain method will give him an increased yield, he would be a very foolish man if he did not adopt it. If he does and the results continue good, his neighbors will soon do likewise. This is the method by which much agricultural educational work is now being done in the United States. You will note, however, that any work of this sort must of necessity have an adequate basis in experimentation, as otherwise many of the demonstrations would result otherwise than expected. It is a type of work that I feel sure will come to be largely employed here in the progress of agricultural education, but it would be unwise to attempt it prematurely; that is, before a sufficient amount of experiments had been completed.

I can conceive of no more interesting or more inspiring work than that of bringing into realization your magnificent agricultural potentialities. It is a work that requires well-equipped men and liberal material support, and you should be content with nothing less. In agricultural work particularly, continuity of effort is very important. It is poor economy not to hold good men when you get them, for if you do not you lose not only the man but also the benefits of his experience which a new man must have before he is of equal value, and good tropical agricultural investigators are scarce.

I feel sure that such an enlightened policy is the desire of the governing officials. It needs also, however, your earnest and constant support. With such a policy established there can be no doubt as to the outcome. The tremendously beneficial results that have resulted elsewhere from such a policy will surely accrue here and make these Islands famous for their agricultural products.

**CERTAIN PROVISIONS OF LAW CONCERNING THE
PREVENTION AND SUPPRESSION OF
CATTLE DISEASES.**

BAGUIO, March 31, 1911.

**EXECUTIVE ORDER }
No. 24. }**

1. The attention of all Insular, provincial, and municipal officials concerned is invited to the provisions of Act Numbered Two hundred and sixty-two,¹ providing for the interment or burning of the bodies of animals which die having rinderpest, and prohibiting the sale or use of any part thereof; of Act Numbered Eleven hundred and fifty-six,² providing for the marking of animals afflicted with surra, and of Act Numbered Seventeen hundred and sixty,³ making provisions to prevent the introduction into the Philippine Islands of dangerous communicable animal diseases, to prevent the spread of such diseases, within the Islands, and so forth. Copies of these Acts and of all rules and regulations governing the subject matters therein dealt with will be furnished in either English or Spanish on application to the Director of Agriculture, Manila.

2. The attention of all provincial boards concerned is called to the provisions of section thirteen (*k*) of Act Numbered Eighty-three,⁴ as amended by section six of Act Numbered One hundred and thirty-three,⁵ making it the duty of the provincial board to adopt, by resolution, regulations for the suppression of any agricultural pest like locusts or cattle disease, to provide for enforcement of the same by fixing penalty for their violation, and so forth.

3. The attention of all municipal officials concerned is drawn to the provisions of section thirty-nine (*m*) of Act Numbered Eighty-two,⁶ making it the duty of the municipal council to regulate the keeping and use of animals, in so far as the same affects the public health and the health of domestic animals, and to the provisions of section thirty-nine (*s*) of Act Numbered Eighty-two, providing that the municipal council shall adopt such measures to prevent the introduction and spread of disease as may, from time to time, be deemed desirable or necessary.

4. It is hereby made the duty of the municipal presidents im-

¹ 1 Public Laws, 638.

² 2 Off. Gaz., 413.

³ 5 Off. Gaz., 939.

⁴ 1 Public Laws, 142.

⁵ 1 Public Laws, 245.

⁶ 1 Public Laws, 110.

mediately to report, by wire, the appearance of any contagious disease, or any unusual number of deaths, among domestic animals, to the Director of Agriculture. A copy of such report shall also be sent to the provincial veterinarian or the nearest local representative of the Bureau of Agriculture, and the provincial governor.

Sick animals shall be immediately isolated in such locality so that they will not come in contact with other animals, people, or anything that may serve to spread the disease; guards shall be placed over them, and their former location shall be thoroughly disinfected to prevent the spread of the disease. Whenever an employee of the Bureau of Agriculture confirms a reported outbreak and notifies a president of a municipality that a contagious disease exists there and states that quarantine corrals are essential for the control of such disease, the president shall take the necessary steps to have constructed, in accordance with plans and specifications furnished by the Director of Agriculture, in such barrios as may be deemed necessary by the veterinarian, the required number of corrals to hold such infected animals as said veterinarian may order placed in quarantine.

Caretakers shall be placed in charge of each corral to feed and water the animals contained therein. No one else shall be allowed to enter the corral without having first obtained a pass issued under authority of the Bureau of Agriculture. Every person entering the corral shall be disinfected before leaving it.

When requested by the Bureau of Agriculture, presidents shall order all animals of the class designated by said Bureau to be assembled for inoculation or examination. Orders shall be issued that all animals of the class affected in an infected barrio be tied or confined and not allowed to run loose. Certain policemen shall be designated whose exclusive duty it shall be constantly to inspect the animals of the municipality and, when a contagious disease is declared to exist in a municipality by an employee of the Bureau of Agriculture, as many policemen as can possibly be spared should be detailed to assist in the eradication of the disease by maintaining quarantine and inspecting barrios. Orders should be given that the animals in an infected barrio should not be watered at a common watering place. Municipal officials are expected and directed to enforce such quarantines as may be prescribed by the Director of Agriculture.

5. It is hereby made the duty of the secretary of the municipality from which shipment of large animals is made by coastwise vessels to furnish to owners of such large animals, on demand, certificates as outlined in Customs Administrative Circular Numbered Six Hundred and twenty-two dated Novem-

ber fourteenth, nineteen hundred and ten, on forms prescribed by the Insular Collector of Customs and furnished by the Bureau of Customs.

6. It is hereby made the duty of all Insular, provincial, and municipal officials, upon receipt of information of the appearance of any contagious disease, or any unusual number of deaths among domestic animals in any municipality, immediately to report the same to the president of the respective municipality. The president shall forthwith investigate the matter, and if he shall find that a contagious disease has in fact appeared, or any unusual number of deaths occurred, among domestic animals in the municipality, he shall immediately report such fact to the Director of Agriculture, by telegraph, and send a copy of such report to the provincial veterinarian or the nearest local representative of the Bureau of Agriculture and the provincial governor.

Whenever an outbreak of contagious disease is confirmed and reported to the provincial governor by an employee of the Bureau of Agriculture, such governor shall immediately notify all municipal presidents in his province, stating the municipality or municipalities in which the disease exists and instructing them to adopt the necessary measures to prevent the introduction of any disease into their municipalities from the infected district.

7. Municipal presidents shall on receipt of this executive order prepare an accurate statement of the domestic animals in their respective municipalities, giving the name and address of the owner and the number of animals of each class, the location where they are kept, and the name and address of the caretaker when he is other than the owner. This list shall be made in triplicate, one copy to be placed on file, one furnished to the provincial governor, and one furnished to the Director of Agriculture or provincial veterinarian. These lists shall be revised subsequently every six months, on the first of January and the first of July of each year, and copies furnished as provided for above.

8. Failure to comply with the provisions of the laws, rules, and regulations, or executive orders governing this matter will subject the responsible official to administrative proceedings under Act Numbered Three Hundred and fourteen.¹

Executive Order Numbered Thirty-six, series of nineteen hundred and ten,² is hereby revoked.

W. CAMERON FORBES,
Governor-General.

¹ 1 Public Laws, 724.

² 8 Off. Gaz., 835.

THE COLLEGE OF VETERINARY SCIENCE, UNIVERSITY OF THE PHILIPPINES.

By ALVIN BROERMAN, D. V. M.,
Instructor in Veterinary Anatomy.

People who through business or prompted by travel are brought into the provinces of these Islands, see a vast expanse of green rolling hills and fertile valleys, uncultivated and but sparsely settled. Where are the herds that should graze and fatten upon these pastures? Or is the climate such that they can not thrive? These questions must arise when comparison is made with other countries similarly situated.

Here lies a country whose agriculture has been nearly paralyzed by the heavy losses of animals from disease. Agricultural prosperity is the necessary factor in the development of these Islands. A widespread financial disability is the great drawback. The prosperity of these Islands is dependent upon a body of trained men capable of coping with these prevalent destructive diseases of live stock. The prevailing ignorance among the people as to the nature, cause, and spread of these diseases and the methods that must be employed to eradicate them, hinders the work that veterinarians are now engaged in. The great contrast between the Oriental and the Occidental people brings opposition to this vital work, where the heartiest coöperation must exist in order to make it a success. Seeing the great need of educating men who through their environment are able to understand and enlighten these people, the First Philippine Legislature provided for the establishment of a College of Veterinary Science.

This College of Veterinary Science is one of the seven established colleges of the University of the Philippines and derives its origin from the Act establishing the university, of which the Rev. Murray Bartlett is president-elect. The Board of Regents had expected to open this college in 1909, but later the opening was postponed in order to allow sufficient time for the completion of the necessary buildings. The college was opened to students

during June, 1910, when a veterinarian from the Bureau of Agriculture was detailed to start this work.

Veterinary medicine has made wonderful advancements in the last half century, particularly in Europe where the degree of doctor of veterinary medicine is recognized as a token of high scientific accomplishment. To obtain the highest degree of efficiency from graduates, it is essential that they possess a good preliminary education. The entrance requirements for admission to this college have been placed at eighteen units, in which four years of English, one and one-half years of algebra, one year of geometry, two years of general history, one year of United States history, two years of Latin or Spanish, one year of physics, one year of botany, one-half year of physical geography, one-half year of physiology, one year of economics, and two and one-half years more of elected subjects are required. A unit is considered to be a subject which meets for one period a day, five days a week, throughout one school year.

The study of veterinary medicine according to the common acceptance of the term, is to gain by attentive consideration a thorough knowledge of the external form as well as the internal structure of our domestic animals. It includes the study of the nature, cause, and the appropriate treatment of their disorders, and through sanitary methods to exterminate infectious and contagious diseases. In order to consider in detail every phase of the wide field of veterinary and sanitary science, it can easily be understood that the five years of work given in this course are indispensable.

On account of the similarity in subjects in the two courses, a large part of the first three years' work of veterinary students will be done in the College of Medicine and Surgery. This is a well-established institution, which prior to its affiliation with the University of the Philippines was known as the Philippine Medical School. Many high schools throughout the Islands giving the four years of work, are found deficient in zoölogy and physics, and with but a few exceptions do not teach chemistry. To avoid students from being handicapped through this condition, it has been decided to include these subjects in the first year of the course in veterinary medicine.

The college buildings consist of three reinforced-concrete buildings, located near Pandacan, adjoining the quarantine yards of the Bureau of Agriculture. This group furnishes at present the laboratory and class-room facilities for the instruction in comparative veterinary anatomy.

A recent appropriation of ₱3,500 has been made to be used

for scholarships in this college. These are to be distributed among capable, energetic students who through the lack of means could not otherwise take up this course.

The Board of Regents was very fortunate in obtaining as the dean of this college the chief veterinarian of the Bureau of Agriculture. Dr. Archibald R. Ward is a man widely known in the veterinary profession and through his experience gained by teaching veterinary subjects, he will be able to give such advice as is necessary to bring about the development of this institution.

There are no graduate Filipino veterinarians at present and only a few private practitioners of veterinary medicine in the Islands. Every province should have young men desirous of taking this course that it may prepare them to become an important factor in the development of animal industry in their home communities. The financial returns possible in stock raising should be treated with attention, as not only are the potential resources sufficient to produce enough meat for local consumption, but for exportation as well.

The small number of students studying veterinary medicine at present gives excellent opportunity for individual instruction. The facilities for giving instruction are ample and the close coöperation of the Bureau of Agriculture gives students opportunity to study the work of disease eradication carried on by this Bureau.

GOVERNMENT SCHOLARSHIPS IN THE COLLEGE
OF VETERINARY SCIENCE OF THE
PHILIPPINE UNIVERSITY.

(Second Philippine Legislature, first session. Assembly Bill No. 513—Act No. 2040.)

An Act to appropriate the sum of three thousand five hundred pesos for the creation of Government scholarships in the College of Veterinary Science of the Philippine University.

By authority of the United States, be it enacted by the Philippine Legislature, that:

SECTION 1. Twenty-five Government scholarships for Filipinos are hereby created in the College of Veterinary Science of the Philippine University, to be filled subject to rules prescribed by the Board of Regents of said university: *Provided*, That there shall not be more than ten of these scholarships for the first year of the said college.

SEC. 2. The sum of three thousand five hundred pesos is hereby appropriated, out of any funds in the Insular Treasury not otherwise appropriated, to carry out the provisions of this Act mentioned in the preceding section during the first year.

SEC. 3. The public good requiring the speedy enactment of this bill, the same shall take effect on its passage, in accordance with section one of Act Numbered Nineteen hundred and forty-five of the Philippine Legislature.

Enacted, February 3, 1911.

NEW THEORIES ON SOIL FERTILITY.

By O. W. BARRETT,

Superintendent of Experiment Stations.

To the planter who has followed the recent great change in the attitude of soil experts as regards what constitutes real fertility of soil, who has an eye on the future methods, problems, and plans for the economic development of his fields—i. e., the feeding area of the world's population—and who is eager to get to the bottom of the intensely interesting and scientific facts with which he is struggling day by day, the following quotation from a recent bulletin (No. 34) of the Hawaiian Sugar Planters' Association experiment station will have considerable value, giving as it does practically the whole length and breadth of the science of soil management in a highly concentrated, yet accurate and appetizing form:

The biological viewpoint of the soil has now become as thoroughly accepted as was the chemical some decades ago. The soil can no longer be looked upon as a nonliving mass merely furnishing a mechanical support to roots of plants and acting as a carrier of moisture and dissolved nutrients to them. All the improvements from the usual practices of good husbandry, such as cultivation, drainage, fertilization, green manuring, etc., are largely explainable by their respective and collective beneficial actions on the teeming millions of microorganisms inhabiting the soil.

The soil can be regarded from several viewpoints, a recent publication dividing them into (1) physiographical (regarding origin), (2) chemical (as a purveyor of plant food), (3) physical or mechanical (as a medium for the transmission of moisture and plant food), and (4) biological, from which viewpoint 'a soil is a more or less weathered rock detritus commingled with organic matter, wherein microorganisms, mostly bacterial in their nature functionate, transforming raw materials into available plant food, reducing relatively complex molecules of animal and vegetable origin into simpler forms suitable to plant nutrition.' Soil fertility, which to the chemists means the maintenance in the soil of conditions necessary for providing the necessary mineral nutrients or their introduction therein from artificial sources; to soil physicists, the optimum mechanical conditions suitable for root development, drainage, and moisture conservation; to later investigators, the elimination of toxic excretions from the growing crop, means to the soil bacteriologist the maintenance of those conditions of

drainage, aëration, nutrition, and reaction which will react most favorably on the development of beneficial soil organisms, and the introduction into the soil, when necessary, of such organisms as are essential to the growth of particular plants.

Bacteria are divided into two general classes; aërobic, or air-loving, and anaërobic, or those developing only in absence of air. Between these two classes are found those which can adapt themselves to either conditions, termed facultative aërobic or anaërobic. Again, both types may flourish together, the aërobic, by withdrawing the oxygen from the soil air furnishing a suitable atmosphere for the anaërobic organisms. In agriculture, however, the conditions of tilth furnish the conditions best suited for aërobic bacteria, and for the purpose of soil investigations these are the only ones requiring close study.

As long ago as 1850 it was a matter of common knowledge that crops of the Leguminosæ family contained more nitrogen than was supplied to them as fertilizer or removed from the soil, but it was not until 1886 that the researches of Hellraigel and Wilfarth established the connection between this increase and the symbiotic fixation of nitrogen from the atmosphere by the plant and bacteria found in the nodules of the roots, named *Pseudomonas radicicola*. The final test of the presence and activity of these organisms in a given soil is the development of the characteristic tubercles on the roots of a plant of this family when growing in the soil, and this does not come strictly within the scope of a biochemical examination of the soil. In connection with these particular organisms, it has been found that when the leguminous plant has failed to develop the root-nodules, other conditions such as tilth, reaction, etc., of the soil being favorable, the absence of the bacteria peculiar to the host plant is demonstrated. The soil can be then inoculated either by the necessary pure culture of the organism needed; or better, by supplying the organism by adding soil from a region where the successful development of the plant in question has shown the presence of the desired organism.

In reference to other bacteria of the soil, however, the problem of inoculation has not yet been worked to a successful conclusion. As a matter of fact, all the organisms necessary for the transformation of nitrogen in the soil are present, in varying numbers and proportions, in all arable soils. Their numerical or potential proportions, however, as well as the correct condition of moisture, temperature, chemical and mechanical conditions of the soils, and the presence of larger organisms, are not always favorable to the development of the most beneficial species. It is by altering or assisting these conditions that the present status of the chemico-bacteriological investigations of soils can serve its most useful purpose toward agricultural economy. Additions of antiseptics, such as carbon bisulphide, thorough aëration and exposing to the heat of the sun, and burning off the surface of fields have produced favorable crop results which can be largely attributed to changes in the bacterial flora of the surface soil. Improving the drainage; altering the mechanical conditions of the soil by addition of such amendments as lime, lime carbonate, or gypsum; correcting soil acidity by lime salts; increasing the humus content of the soil by plowing under green crops or addition of stable manure; addition of fertilizers supplying necessary mineral nutrients—all find a partial answer as to the reason of increased crop returns in their respective effects on the beneficial organisms of the soil.

EXECUTIVE ORDER NO. 13.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,

EXECUTIVE BUREAU,

Manila, February 28, 1911.

EXECUTIVE ORDER }
No. 13. }

The provincial governor of each province organized under the Provincial Government Act (No. 83) and under the Special Provincial Government Act (No. 1396) is hereby authorized and directed to forward to the Bureau of Agriculture promptly on the first of each month a brief report on crop conditions in his province for the preceding month, and the Director of Agriculture is hereby instructed to compile such reports for publication in the Philippine Agricultural Review and for distribution to the English and Spanish press published in the Philippine Islands. The Chief of the Bureau of Insular Affairs, War Department, Washington, District of Columbia, will also be furnished a copy of the reports thus compiled by the Bureau of Agriculture.

Provincial governors will be furnished the necessary forms by the Bureau of Agriculture.

W. CAMERON FORBES,

Governor-General.

B. A. FORM No. 38.

FORM FOR MONTHLY SUMMARY OF CROP CONDITIONS.

DEPARTMENT OF PUBLIC INSTRUCTION.

DEPARTAMENTO DE INSTRUCCIÓN PÚBLICA.

BUREAU OF AGRICULTURE.

OFICINA DE AGRICULTURA.

MONTHLY SUMMARY OF CROP CONDITIONS.

BREVE INFORME SOBRE EL ESTADO DE LAS COSECHAS.

(Province.)

(Provincia.)

(Month covered by report.)

(Mes á que se refiere el report.)

1. A brief statement regarding the work that has been done with this crop during the month (planting, harvesting, etc.).

Un informe breve sobre el trabajo que se ha hecho con esta cosecha durante el mes (siembra, recolección, etc.)

2. A brief statement of any damage that has been done to this crop during the month by insects, plant diseases, or unfavorable weather conditions.

Un informe breve de cualquier daño que haya sufrido esta cosecha durante el mes á causa de insectos, enfermedades de las plantas, ó condiciones desfavorables del tiempo.

3. The local price of product in the provincial capital on the last day of the month, in metric unit of weight or measurement.

Precio local del producto en la capital de la provincia el último día del mes en unidades métricas de peso ó medida.

4. Remarks on the general condition of this crop throughout the province.

Observaciones sobre el estado general de esta cosecha en toda la provincia.

Rice. (In quoting price state whether it is for paddy or cleaned rice)

Arroz. (Al fijar el precio dígame si se trata de palay ó de arroz limpio.)

AbacaAbacá.
.....
.....
.....
.....

Coconuts. (Quote price of copra, coconuts, oil or tuba depending upon how product is marketed)

Cocos. (Fijese el precio de la copra, cocos, aceite ó tuba, según la forma en que se venda el producto.)
.....
.....
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.....

Sugar cane. (When marketed in panochas give price by weight)

Caña dulce. (Cuando se venda en forma de panochas, desde el precio según el peso.)
.....
.....
.....
.....

TobaccoTabaco.
.....
.....
.....
.....

Corn. (Quote price per liter and state whether it is on the cob or shelled)

Maíz. (Dése el precio por litro y hágase constar si es en mazorcas ó desgranado.)
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Other important cropsOtras cosechas importantes.
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JUNE, 1911.

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BRIEF OF B. A. FORM NO. 38.

MONTHLY SUMMARY OF CROP
CONDITIONS.

Municipality of
Province of
Month of, 191

RECEIVED IN BUREAU OF AGRICULTURE

....., 191

ABACÁ (MANILA HEMP).—AGRICULTURAL EXTENSION WORK LECTURE No. 3.¹

By M. M. SALEEBY, *Fiber Expert.*

INTRODUCTION.

The object of this lecture is to invite attention to some of the more important matters connected with the abacá industry in the Philippine Islands. The importance of this industry is probably well understood by everyone present, and it is because the growing of abacá and the preparation of this fiber for the market is such an important industry that every effort should be made to make it a profitable one.

There are two agricultural products that are of supreme importance in the Philippine Islands. These two products are rice, which is our great food staple; and abacá, which brings into the Islands more than thirty million pesos each year. I do not mean to say that other products, such as sugar, tobacco, copra, and maguey, are not also of great importance, but first of all are rice and abacá. More than half of the money that comes into the Philippine Islands each year is the money that is sent here to buy abacá. It is easy, therefore, to understand why a large crop of abacá that sells for high prices means prosperity and comfort, while a small crop and low prices means hardship and want throughout many provinces and to many thousands of our farmers. In this lecture I shall try and suggest to you some ways by which we can produce a larger crop of abacá, and also a better quality of fiber that will bring higher prices in the markets than you are receiving at the present time.

You are all familiar with the plant which, in the Philippine Islands, is called either abacá or lanut, and the fiber that is known as abacá. In the United States and Great Britain this fiber is known as Manila hemp, manila, or hemp.

¹ The agricultural extension work lectures are elementary papers intended, primarily, for lecture work in the provinces.

SELECTION OF VARIETIES.

There are many varieties of abacá under cultivation in the leading abacá districts, and often six or seven of them (sometimes more) are found growing in one locality. The principal differences among the abacá varieties are in color, size, and shape of the stalk; in the quantity and quality of the fiber; in the tendency to produce suckers; and in the degree of hardness of growth. Some varieties of abacá are much more profitable to grow than others. It is thus apparent that a thorough knowledge of the different varieties of abacá and their characteristics is of extreme importance to all prospective planters.

The qualities that must be considered in selecting desirable varieties for starting a new plantation are large and rapid growth, abundance of fiber of good quality, and facility of extracting the fiber. Heretofore the abacá plant has been propagated indiscriminately, with the result that many inferior varieties are continually propagated and can be found growing in almost every abacá plantation in the Islands. Laborers are, as a rule, the best judges of varieties. They are averse to stripping inferior varieties, and when labor is scarce it has been found wise not to force them to do any work which they justly claim does not give them due compensation. For a comprehensive description of the most common varieties of abacá that will enable you to select seed of desirable quality, I refer you to Farmers' Bulletin No. 12 on "Abacá (Manila hemp)" and to the report of the Director of Agriculture for the fiscal year 1910, which is published in the January number of the PHILIPPINE AGRICULTURAL REVIEW, 1911. Both of these publications can be obtained without cost by writing to the Director of Agriculture, Manila, P. I.

CLIMATE.

The climatic conditions that determine the possibility of successfully raising the abacá plant are amount and distribution of rainfall, temperature, atmospheric humidity, and prevalence of strong winds. Rainfall must be abundant and evenly distributed the year round; for a drought of two or three weeks will considerably retard the growth of the plant, while one of a longer duration is always followed by fatal results. The degree of temperature must neither be too high nor too low, for the one increases the evaporation of moisture from the soil and the broad leaves of the plant, and the other interferes with the function of its different organs. A high degree of atmospheric humidity is necessary for the best growth of the plant, especially in those locations subject to frequent spells of dry weather.

The prevalence of strong winds is ruinous to the abacá plant, for its broad and heavy leaves may easily be injured by them. In all locations subject to such strong winds the abacá must be well protected by large trees, planted at regular intervals, which will serve to break the force of the wind.

SOIL.

The three kinds of soil in which abacá thrives best are, in order of superiority, the alluvial plains subject to overflow by rivers or mountain streams, the moist mellow loams formed by the disintegration of volcanic rock, and other well-drained loams. One or more of these three kinds of soil are found in every district where abacá is successfully grown, and they are invariably found to possess a large quantity of humus. Denuded soils, or soils from which all humus has been washed away, are not, as a rule, suitable for growing abacá, unless humus can be supplied in one form or another. Cogon lands afford an example of denuded soil.

Dry sandy soil such as is found along the sea beach, stiff clay loams, rocky limestone soil, and water-logged soil should be avoided. An attempt to transform these inferior soils into proper condition, either by plowing, irrigating, draining, or fertilizing, as the case may require, usually entails too much expense and labor to make such operations practicable.

The "lay of the land" has a great deal to do with the successful cultivation of abacá. Other conditions being the same, steep hillsides are not as favorable as the adjoining level land.

PROPAGATION.

There are two common methods by which the abacá plant is propagated. The first is by use of the rootstocks, or the underground part of the stalk; and the second by the use of the shoots, or suckers.

The use of the rootstocks is the more desirable method for starting a new plantation, because they are more liable to grow, easier to handle, and retain their vitality for a longer period than the suckers. The rootstocks are set out entire, if they are small; but, if they are large, they are usually cut into two or three sections. Cutting the rootstocks in this manner results in producing healthier and more luxuriant plants than when planted entire, and also reduces, by one-half, the number of rootstocks required.

The use of shoots or suckers in propagating abacá is probably the most general method. Healthy and well-developed shoots only should be selected. This method, however, has two draw-

backs; first, it is impracticable to transport shoots a long distance without injuring them in some way; second, a large percentage of them will fail to take root, especially if they have to be transported long distances. This method, however, can be recommended in replanting in a field where some of the root-stocks have failed to come up.

PREPARATION OF THE SOIL.

The first process in preparing the land for planting is the clearing of forest. The land should first be cleared of all weeds, underbrush, and small trees. The material that is cut should be left scattered on the ground until perfectly dry, when the felling of the large trees should commence. After felling the large trees it is advisable to cut off all branches and limbs. If this is done the waste material will dry more quickly and will be more thoroughly consumed when burned. Three, and sometimes more, burnings are required before the soil is sufficiently clean to allow of easy and systematic planting. The clearing of forest should not be started until about the middle of the dry season, and it will take the balance of the season to have the soil prepared and the plants set out. If clearing is started at the beginning of the dry season, the trouble and expense of thoroughly burning the timber would be great, and the plants will have to be set out at least six weeks before the rainy season is on, causing a large number of them to fail to grow. In case of planting on a large scale, however, it may be necessary to begin clearing early in the dry season.

Ordinarily, it is almost impossible to plow the soil preliminary to planting on account of the large number of trunks of trees of all sizes that cross the field in all directions. Therefore, to keep down the growth of weeds and grasses, resort must be had to planting some kind of vine that will serve to kill the weeds and, at the same time, furnish food for the laborers. Camotes are generally planted for this purpose, but various other plants, preferably legumes, will serve the purpose. Such plants, however, must not be planted until after the abacá plants are at least a foot high.

PLANTING.

Immediately after preparing the soil planting should begin. The time should be the end of the dry season. The distance the plants are set apart ranges from 3 to $3\frac{1}{2}$ meters. This will give from 1,250 to 850 plants to the hectare.

The lining should be made with a chain or a cord. The former is preferable, as it will not shrink when subjected to moisture.

It is very important that the rows be straight in order to allow of proper cultivation during all stages of growth and to prevent the intermingling of the hills as a result of their natural tendency to spread out as they grow old.

The hole should be large enough to receive the rootstock and leave a space of about 10 centimeters all around to be filled in with the soft earth dug out. This will give a good start for the tender roots of the young plant. The rootstocks should be put erect in the hole with the stalk end up. The hole must not exceed 25 to 35 centimeters in depth, depending on the size of the root to be planted.

CULTIVATION.

To keep down the growth of weeds before the abacá plants have had time to shade the ground, most of the planters, if not all of them, plant camotes; and the only cultivation that the plants receive at this time is to keep the soil open and loose immediately around each plant. With this method, however, it will be necessary to go over the plantation once every two months during the first year. During the second and third years hardly any cultivation of this nature is needed, as during this period the plants shade the ground and stop the growth of weeds as well as that of the camotes. After the end of the third year three or four cleanings a year will be required, as by that time a number of stalks of each hill will have been harvested and the hills opened, exposing the soil to the rays of the sun, which causes many kinds of weeds to spring up.

Cowpeas, velvet beans, mongos, and various other leguminous plants instead of camotes can be cultivated with abacá to great advantage. These plants, besides yielding valuable food products, enrich the soil with nitrogen, which element is essential to the growth of abacá.

The cleaning of weeds can be better and more economically accomplished by the use of hoes instead of bolos. Whether cleaning is done by hoes or bolos the laborers must be very carefully watched while they are doing the work, as there is always danger of their injuring the young shoots, and they are liable to move the soil away from the plants, which will in course of time expose a large part of the rootstocks. After the soil immediately around the plants is loosened and freed from all weeds it must be pressed around the hill in order to prevent it from washing away.

If the clearing of forest is accomplished as previously indicated, the soil ought to be fairly clean of timber after the third

or fourth year, and modern cultivators can then be used for cultivating the soil. The modern methods of cultivation are more economical than the ordinary native methods, and will result in improving the quality of the fiber and rendering the plants capable of standing longer periods of drought.

HARVESTING.

The abacá plant when mature consists of a group of twelve to thirty stalks. These stalks are in all stages of development, but usually two to four only can be harvested at the same time. The stalk is mature at the time of the appearance of the blossom, or shortly before. As a rule no cutting should commence before the plant is two to two and one-half years old. After the first harvest subsequent cuttings can be made every four to six months.

The manner in which the stalks are harvested affects considerably the life and welfare of the plant. Owing to the fact that the stalks of an abacá plant, especially young plants, are crowded together and tied to each other by their old dry leaves, great care should be exercised in felling the mature ones. If the laborers are left to themselves they will cut off the mature stalks at the bottom and allow them to fall, quite often bringing down with them or tearing off the leaves of some of the immature stalks. The continued practice of such careless cutting is bound to result in serious damage to the plants. To avert such damage the men should be trained to cut down the stalks in a proper way. These men should be furnished with a long pole having a sharp knife attached to it at the top, with which the top of the stalk immediately under the base of the whorl of leaves, and also all the dry leaves tying it to the adjoining stalks, are cut off. The stalk, being left separate, can then be cut down with a bolo or any knife having a sharp blade. The cutting should be made 5 to 7 centimeters from the crown of the rootstock and on a slant, so that water will not collect on the stump and cause it to rot and injure the root before the young shoots have had time to develop roots of their own to supply them with the required nourishment.

Another grave mistake is often made in harvesting the abacá plant. Owing to pecuniary difficulties or to mere ignorance, some planters overcut the plants, leaving only the young shoots. This method is ruinous to the plant. It opens the hill too much to the sun, increases the growth of weeds, shortens the life of the plant, and reduces considerably the total output of fiber.

EXTRACTION OF FIBER.

The abacá stalk ranges from 2 to 7 meters in length and from 15 to 45 centimeters in circumference at the base. It consists of overlapping leaf sheaths from the outer layer of which the fiber is obtained.

The common method of allowing the strippers to work in any part of the field they choose and in any manner they desire has been one of the chief causes of the production of inferior fiber and the consequent decline in prices. The disadvantages of the above method may be summed up as follows: First, the overseer can not watch the work of the strippers as often and as closely as necessary; second, the strippers when left to themselves prefer to cut the large stalks only, or the stalks of certain good varieties, leaving out the small stalks and omitting the plants of inferior varieties; third, the strippers have no interest in turning out a superior grade of fiber, and are often seen to leave the strips lying out in the field exposed to the sun and rain until they turn yellow; fourth, the strippers often reduce the tension of the knife upon the block of wood so as to make it much easier to pull the strips; and fifth, they work at their leisure, starting and finishing work at their convenience.

The following method will serve to remedy all the defects and disadvantages of the above method of extracting the fiber: A long shed should be built at a spot as near the center of the plantation as possible, under which all strippers should be made to set up their knives and adjust them to the satisfaction of the proprietor or overseer. A gang of men well trained in felling the stalks and separating the strips should be employed under a competent overseer, while a few boys with carts and carabaos or cattle can haul the strips from the field to the shed and turn them over to the man in charge, who in turn distributes them to the men under him. A few more boys should be with the strippers in the shed to receive the fiber immediately after it is stripped and spread it to dry on the lines of wire stretched outside the shed. During rainy weather, however, similar wires should be set up under a shed, where the fiber should remain spread until it is perfectly dry. Under no circumstances should the hanks of wet fiber be left unspread, as the fiber will then be sure to sweat and discolor.

By adopting the above method four advantages will be gained: First, the field is harvested in one uniform way throughout; second, the hills are better handled and every mature stalk in

them, whether large or small, is harvested; third, more work is gotten out of all laborers, due to division of labor; fourth, sickness among laborers is reduced, as they are not any longer exposed to changes of climate, such as heat, wind, and dampness, as they are when working out in the field.

YIELD OF FIBER.

The yield of fiber varies greatly, depending on soil and climatic conditions, the use of modern methods of cultivation and fiber extraction, the selection of varieties, irrigation, and careful management. From 375 to 2,500 kilos (6 to 40 piculs), or even more, can be obtained per hectare; but an average of 1,000 to 1,250 kilos (16 to 20 piculs) is considered a good yield. The average yield throughout the Islands does not exceed 400 kilos ($6\frac{1}{2}$ piculs) per hectare.

QUALITY OF FIBER.

Softness, color, and strength are the qualities usually considered in grading abacá fiber. The degree of softness, color, and strength is affected by soil and climatic conditions, by the variety cultivated, by the position of the sheath in the stalk, and by the manner of extracting, drying, and handling the fiber.

The fiber increases in softness and whiteness from the outside sheaths toward the inner ones, those around the core being the softest and whitest. After every four or five sheaths we invariably find a noticeable change in the quality of the fiber. Given from 16 to 25 sheaths to the stalk, the position of the sheaths will in itself be responsible for only four or five grades of the fiber. But, owing to the imperfect method of extracting the fiber and the lack of care in handling it prior to and after extraction, we find as many as 17 grades in the market, the lowest five or six of which have no reason to exist.

The following are the standard grades of abacá fiber as known in the United States and European markets, which for convenience I shall place under four groups:

- I. Best marks, or F. E. A. quality, consisting of 300 per cent, 250 per cent, and 200 per cent over good current.
- II. Good marks, or F. E. B. quality, consisting of 150 per cent, 100 per cent, and 50 per cent over good current.
- III. Middle marks, or grades, consisting of good current, 75 per cent over current, midway, and 25 per cent over current.
- IV. Low marks, or grades, consisting of current superior seconds, good seconds, fair seconds, good brown (red), fair brown (red), and Daet current.

The present prices (February 1, 1911) paid for the above grades in the London market are as follows:

- I. Ranging from ₱26.25 to ₱27.50 per picul.
- II. Ranging from ₱25 to ₱25.65 per picul.
- III. Ranging from ₱14 to ₱22.50 per picul.
- IV. Ranging from ₱11.25 to ₱11.85 per picul.

The grades that make up Group IV should not exist, for they are caused by improper extraction of the fiber and by lack of care in handling it. If the fiber is properly extracted and handled it should average in Group II. The Bureau of Agriculture has conducted a series of fiber extraction experiments, using entirely the ordinary methods. In every case, the fiber turned out averaged at least 50 per cent over good current, or six grades above the general average, while the waste ranged between 8 and 10 per cent more than that obtained in turning out much inferior grades. The results of those experiments are confirmed by the planters of the Davao district, who, according to the last reports received from them, are selling their product at prices ranging between ₱15 and ₱16.50 per picul on their plantations. Their fiber, to command such a high price, must average, according to the present Manila quotations, 50 per cent or 100 per cent over good current. There can be no reason whatever why planters in the other abacá districts should not be able to produce the same grades and receive the same prices.

RENEWING OF OLD PLANTATIONS.

The life of the abacá plant varies from twelve to twenty years, depending on the adaptability and fertility of the soil and on the extent of care and cultivation given to the plant. Heavy soils, lack of cultivation, carelessness in felling the stalks, and the frequent digging up of roots all tend to shorten the life of the abacá plant.

In the provinces where the cultivation of abacá has recently been started, the method of renewing old plantations has not, as yet, been given any consideration. In the Provinces of Albay, Leyte, Sorsogon, etc., where abacá has been grown for years, the common method of renewing the plantations consists in digging up shoots of old plants and in planting them in the intermediate spaces. This system is wholly undesirable, and the plants thus reproduced are, for obvious reasons, neither so healthy nor so productive as the original ones.

Every year a part of the old plantation should be plowed to a depth of 15 to 20 centimeters and a crop of corn or rice raised on it. After the crop is harvested all that is left of the corn or

rice plants should be plowed under. After these operations the abacá rootstocks can be set out as in the first planting. Cleaning with bolos should be done away with now, and the successive operations of cultivation and interplanting of leguminous crops resorted to to kill the weeds, keep the soil in good condition, and restore to it its fertility. Thus, in the course of a few years, a new plantation with vigorous plants will stand on the site of the older one.

CONCLUSION.

In concluding I repeat that the two most important steps in the abacá industry, namely, cultivation and extraction of fiber, have not been conducted in a businesslike manner. The great majority of the planters still cling to the two erroneous beliefs that, while the price paid for the fiber remains low, they can neither afford to *cultivate* their fields nor *turn out* superior fiber. They look upon proper cultivation as an unnecessary and unproductive expense, and upon the production of superior fiber as entailing an unnecessary increase of waste. In the latter belief they claim that, as long as they get almost the same price for good as for bad fiber, it is to their advantage to produce the latter. The planters may be right in stating that the local buyers, especially the Chinese, do not properly discriminate between superior and inferior fiber and are therefore encouraging the production of the latter, but this can scarcely justify their conduct. They ought to realize that it is to their interest and the interest of the industry in general to turn out good fiber. They should free themselves from all local buyers who do not treat them justly and should strive to secure the best market for their product.

If a general rise in the price of abacá fiber in any province be desired, a general production of superior fiber must precede it. The planters will not fail to get a suitable market for their product if they work together and discard all methods prejudicial to their interest and detrimental to the industry in general.

STATISTICS REGARDING SUGAR CANE AND TOBACCO IN THE PHILIPPINES.

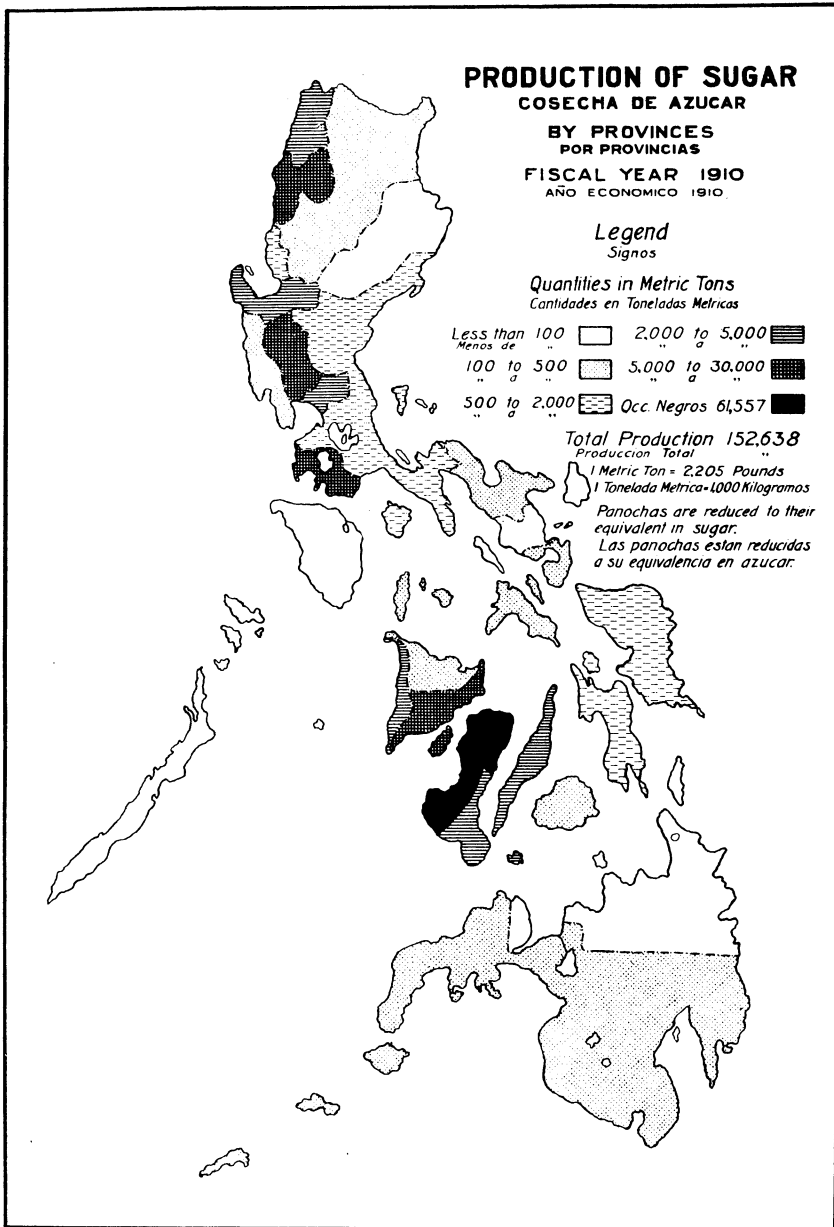
By W. D. HOBART, *Statistician.*

Statistics on sugar in the Philippine Islands, fiscal year 1910.

Province.	Amount of sugar produced.		Area cultivated.	Production per hectare.
	Piculs.	Metric tons.		
			Hectares.	Kilos.
Agusan				
Albay	1,146	72	141	514
Ambos Camarines	3,081	195	367	531
Antique	53,186	3,364	1,580	2,129
Bataan	7,491	474	341	1,389
Batangas	190,955	12,078	5,183	2,330
Bohol	1,941	123	166	739
Bulacan	54,442	3,443	2,935	1,173
Cagayan	2,154	136	281	484
Capiz	6,729	426	385	1,105
Cavite	24,910	1,576	1,198	1,315
Cebu	33,007	2,088	1,866	1,118
Ilocos Norte	41,443	2,621	2,338	1,121
Ilocos Sur	101,116	6,396	3,412	1,874
Iloilo	124,564	7,879	3,408	2,311
Isabela	475	30	42	715
La Laguna	23,880	1,510	741	2,038
La Union	24,934	1,577	1,018	1,549
Leyte	10,854	687	815	843
Mindoro	177	11	19	589
Misamis	726	46	34	1,350
Moro	1,620	102	119	861
Mountain	2,274	144	175	821
Nueva Ecija	10,055	636	527	1,206
Nueva Vizcaya	617	39	60	650
Occidental Negros	973,231	61,557	26,820	2,235
Oriental Negros	48,266	3,053	1,410	2,165
Palawan	60	4	5	759
Pampanga	454,264	28,732	16,551	1,735
Pangasinan	35,333	2,235	2,794	800
Rizal	30,345	1,919	1,752	1,095
Samar	8,622	545	667	813
Sorsogon	7,292	461	398	1,159
Surigao	7,425	27	47	572
Tarlac	115,810	7,325	4,427	1,654
Tayabas	15,148	958	1,005	953
Zambales	2,692	170	141	1,207
Total	2,413,270	152,639	83,168	1,835

NOTE.—1 picul=63.25 kilos. 1,000 kilos=1 metric ton.

The differences between the provinces in production per hectare, aside from those arising from varying soil fertility, are in part accounted for by destruction in some localities from drought or storms, or because of locusts or rats. Locusts in some places destroyed a great deal of cane at an early stage of growth, some municipalities reporting an almost total loss.



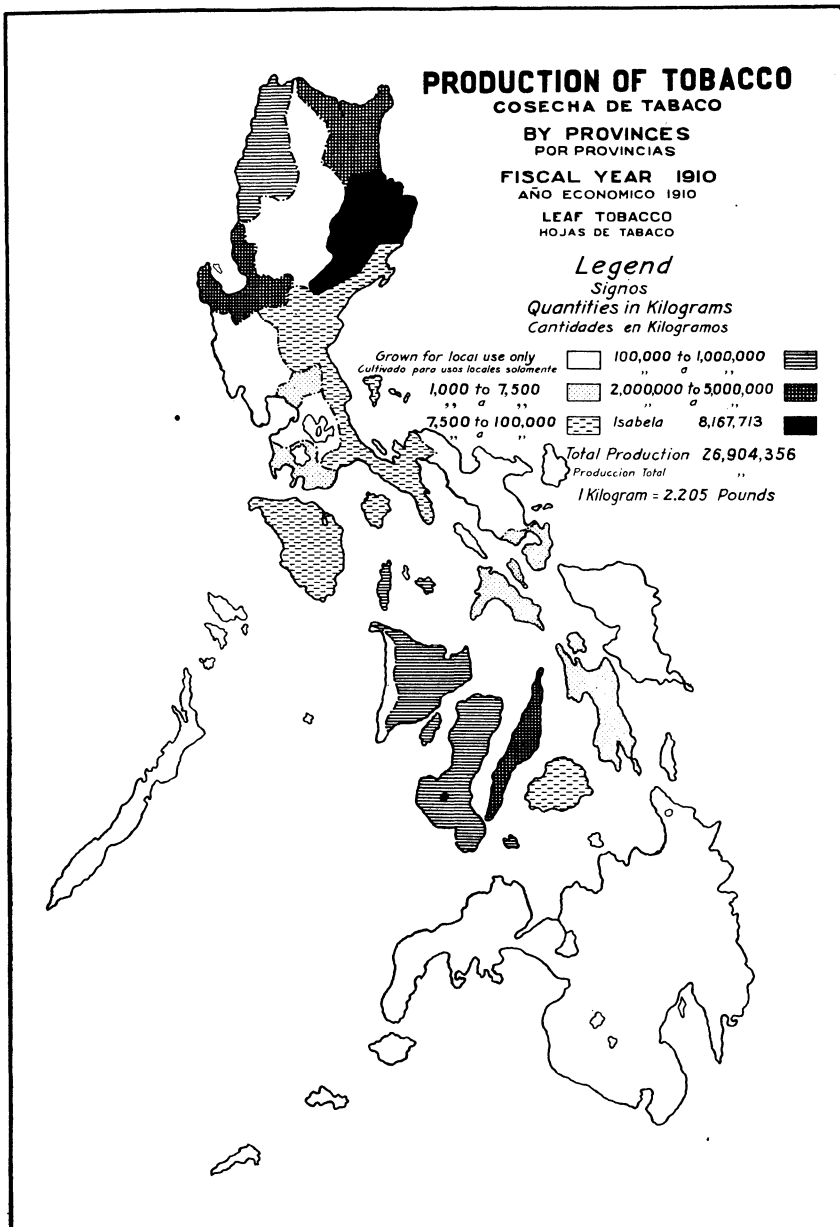
THE PHILIPPINE ISLANDS.

Statistics on tobacco in the Philippine Islands, fiscal year 1910.

Province.	Amount of tobacco produced.		Area cultivated.	Production per hectare.
	Quintals.	Kilos.		
			Hectares.	Kilos.
Agusan				
Albay				
Ambos Camarines				
Antique	605	27,830	57	488
Bataan				
Batangas	701	32,246	97	332
Bohol	462	21,252	98	228
Bulacan	1,073	49,358	63	783
Cagayan	99,786	4,590,156	9,614	477
Capiz	7,043	323,978	895	368
Cavite	60	2,760	20	138
Cebu	102,933	4,734,918	7,248	653
Ilocos Norte	11,030	507,880	1,438	352
Ilocos Sur	5,169	237,774	563	422
Iloilo	13,662	628,452	2,172	289
Isabela	181,158	8,333,268	15,857	525
La Laguna				
La Union	94,957	4,368,022	6,637	658
Leyte	7,543	346,978	1,666	208
Mindoro	957	44,022	180	244
Misamis	38	1,748	13	134
Moro	101	4,646	21	221
Mountain	568	26,128	117	223
Nueva Ecija	4,535	208,610	705	295
Nueva Viscaya				
Occidental Negros	18,231	838,626	1,572	533
Oriental Negros	7,880	362,480	697	520
Palawan	30	1,380	4	345
Pampanga	166	7,636	29	263
Pangasinan	45,805	2,107,080	3,212	656
Rizal				
Samar	1,270	58,420	211	276
Sorsogon	332	15,272	97	157
Surigao	530	24,380	52	468
Tarlac				
Tayabas	2,164	99,544	290	343
Zambales	54	2,484	6	414
Total	608,843	28,006,778	53,626	522

NOTE.—1 quintal (Spanish) = 46 kilos. 1 hectare = 2.47 acres.

The amount of tobacco produced by different soils varies greatly, accounting for the great difference between the various provinces in the production per hectare. In many of the provinces a lighter growth is accounted for because tobacco is planted as a secondary crop to rice or corn.



THE PHILIPPINE ISLANDS.

MANGO PESTS IN CAVITE AND RIZAL.

By P. J. WESTER, *Horticulturist*.

The complaint has frequently been made that the mango trees in the Philippines are not productive, but the growers seem to have accepted this fact as providential, and it is not apparent that anything has been done in the past to ascertain the cause or find a remedy.

The failure of the mango trees to set fruit was recently presented to the Bureau of Agriculture by Miss Francisca Tirona, mango grower in Imus, Cavite Province, and the writer, accompanied by Mr. José Rivera, made a trip of inspection through the mango-growing districts of Cavite Province early in April to investigate the trouble with a view of finding a remedy.

Mangoes are planted extensively at Imus, San Francisco, and San Roque, which towns may be termed the centers of the mango industry in the province. They are also planted in considerable numbers at Caridad, Noveleta, San Juan, and Kawit; a few are also found in Rosario. Traveling to Manila from San Roque on the Cavite line of the Manila Railroad Company the number of trees decreases as one approaches Binacayan, from which point to Manila they occur only as scattered trees. Perhaps it is well to mention here that with exceedingly few exceptions, and those containing only a few trees, orchards or groves of mangoes, as usually understood by these terms, do not exist in the Province of Cavite. Rice is the main agricultural crop in the mango districts of the province, and the mango trees are planted along the edges of the rice fields and along the sides of streams and ravines topographically unsuited for rice cultivation. Except in San Roque and Caridad, where the soil is mostly sandy, the land consists of a stiff loam or clay that during the dry season is baked hard. The trees appear to thrive equally well in either soil and are with very few exceptions vigorous and thrifty, and scale insects are practically absent; the few present do not appear to injure the trees.

Driving through Imus and adjoining barrios, the almost universally blackened and dead flowers on the mango trees at once attracted attention, and frequent stops were made for examination of the flowers. These were in most instances found to be covered with innumerable small wedge-shaped homopterous insects in all stages of development, able to fly or jump but short distances. By sucking the juices from the buds and tender stems, these insects injure them, causing the flowers to drop. They also secrete a honey dew, in which, deposited on the foliage and the flowers, a sooty mold develops, and the presence of the insects is readily detected by the blackened leaves and flower panicles. Where they occur in great numbers their presence is also heralded by a fetid odor recognizable at a considerable distance from the trees. At Imus, these insects have practically ruined this season's mango crop, and are doing great damage to the mangos at San Francisco. Less severe is the injury to the second bloom in San Roque and Caridad, but owing to the ravages of this as well as another pest that will presently be referred to, the early bloom there was practically entirely destroyed. At Muntinglupa, Rizal, in the mango grove owned by McCondray & Co., the insect under discussion was found in comparatively few numbers, and the trees now in bloom give promise of a good crop of fruit.

It is quite probable that this insect is identical with the so-called "mango fly" in India (three species of homoptera (*Idiocerus niveosparsus* Leth., *I. atkinsonii* Leth., and *I. clypealis* Leth.)), which in certain years has been reported to reduce the mango crop to one-third of its normal amount in that country. In India these insects are present on the mango trees throughout the year, but hatch in great numbers every few years in the flowering season and destroy the bloom. It is improbable that the successful spraying of infested trees with London purple, reported in one instance from India, was due to the virtue of the spray, for being a sucking insect it can be combated with a contact spray only. In India the use of contact sprays for this insect has been reported ineffective, but this is probably due to excessive dilution of the spray, or possibly to the application of the insecticide at a time in the life history of the insect when it is difficult to destroy.

Another pest that appears to be quite destructive to the mango bloom is a caterpillar that enters the central stem of the flower panicle and hollows it out, causing it to shrivel up and die. Specimens of the larvæ were not found, and it is therefore doubtful whether this is the same species as another caterpillar

that gnaws the surface of the stems with the same result and in its progress covers itself with a web of refuse and excrements. Two well-defined species were found engaged in this work, one of which is rare and perhaps of little importance. Particularly destructive work of these caterpillars was seen in San Francisco, but they were also noted at Imus and other points visited. The earliest observations of the stem borer, the first mentioned of these caterpillars, appears to have been made in December, 1910, at Santa Mesa, Rizal, by Mr. O. W. Barrett, superintendent of experiment stations of this Bureau.

An investigation of the life history and habits of these insect pests, whose economic importance in relation to the mango industry in the Philippines does not appear to have hitherto been recognized, will be made by the Bureau of Agriculture, with a view to discovering successful remedies for their control and eradication.

REPORT ON TOBACCO ON THE ISLAND OF CEBU.

By R. W. ROWE, *Tobacco Expert.*

It is estimated that the Island of Cebu produced 3,500,000 kilos of tobacco during the year 1910. Of this amount, 3 per cent was consumed in the Visayan Islands; the remainder was sold for export to foreign countries.

On the east coast the principal tobacco-producing municipalities are Tabogon, Carcar, Sibonga, and Argao, and on the west coast Tuburan, Asturias, Balamban, Toledo, Barili, Dumanhug, and Moalbual. Nearly all the other towns along the coast produce a little tobacco, which is consumed locally.

On account of climatic and soil conditions, a heavy, dark leaf is produced, suitable only for export to countries that demand a heavy textured and dark colored leaf.

The island varies in width from 8 kilometers at the southern end to 29 kilometers at Danao, then decreasing to 12 kilometers at the northern end. There is a ridge of mountains extending along the entire east coast, 4 to 7 kilometers back from the coast and crossed by a number of rivers along which are narrow winding valleys. On the west coast the same conditions exist except the mountains are farther back and between the ridges the country is very hilly. Practically all of the tobacco is produced on the slopes of hills and mountains that are exposed to the salt air, which has long been known to be injurious to fine grades of tobacco. The soil is derived from carolene limestone and varies in color and texture from a brown silt loam to a heavy black clay, on which only a dark heavy leaf can be produced. The general character of the leaf produced is as follows:

Color: Small leaves very dark, large leaves dark and uneven in color.

Shape: Varying from a short narrow leaf to a long, wide, pointed leaf, there being no uniformity in shape.

Veins: The midrib is large. Lateral veins and feeders large, irregular and wiry.

Texture: All leaves heavy.

Stretch: Good, as it always is on heavy textured types.

Finish: Good, when picked at proper stage of ripeness and properly cured.

Grain: Close and poor.

Burn: Poor.

Ash: Dark and very compact.

It is acknowledged by the best tobacco men in the Philippine Islands that Cebu tobacco is not suitable for cigars, but only for export.

The Filipinos are accustomed to this strong tobacco and prefer it to any other, and it can be found in almost every public market in the Visayan Islands. There are no large tobacco haciendas on the Island of Cebu. The tobacco is grown in small patches of 500 to 5,000 plants and on all kinds of soil. As a rule it is grown in the same field with corn and in many instances one can see both crops growing together, first a row of corn then a row of tobacco. Another custom is to leave the cornstalks standing after picking the corn, to act as a shade for the tobacco plants, later cutting down and removing them when the tobacco has started to grow.

The local planters have no special time to sow their seed beds, but sow them any time from the first of September to the first of January. They select no special place for the seed beds; most any place that is handy to the field where the tobacco is to be grown is considered satisfactory. The bed receives no care after the seeds are sown; if they do not come up more seed is sown. The farmers also have no special time for transplanting, but transplant any time from the last of October to the last of February. Ten thousand to 12,000 plants are set to one hectare, yielding on an average 10 quintals. The best tobacco is secured from plants transplanted the last of October and the first part of November. Tobacco that is transplanted later does not produce as many leaves, or as good a leaf; also, insects do not bother the early set tobacco as much as the late set.

Practically all the cultivation is done by hand with a bolo, and as a rule the fields are kept clear of weeds. Not only are the fields cultivated by hand but the land is prepared in the same manner, this being due to the scarcity of carabaos and the steep slopes on which the tobacco is raised, which can not be cultivated with a carabao and a plow. Plants of all sizes may be seen in one field, there being no uniformity. Several different types may be seen also, which shows that no attention is paid to seed selection. The leaves are harvested at all stages of ripeness, and as a rule they are picked a little green, which, when cured,

gives a very dark, strong leaf. After the leaves are picked they are strung, without folding, on a piece of bejuco (rattan) varying in length from 1 to 1½ meters. After stringing they are hung under the houses by tying the ends of the bejuco around a pole. As soon as air cured, the tobacco is taken down, put in "manos" (hands) of 100 leaves which are tied up with grass, and then put in piles to ferment. The grading is the same as in all other sections—by length and soundness. The best grades, called "escogidos," are sold locally and a mano three years old brings ₱3 to ₱4, and when sold by the leaf 5 centavos a leaf. The price varies from 1 to 5 centavos a leaf, depending on the age of the tobacco. All of the poorer grades are sold by the quintal for export, the price varying according to the demand. The *Compañía General de Tabacos de Filipinas* are the principal buyers and have warehouses in all the important tobacco sections. There are also a few Chinese buyers.

The principal work to be done with tobacco in this section is to increase the yield per hectare, which can be done by taking better care of seed beds; transplanting the last of October or early in November, depending somewhat upon the weather; applying a mixture of Paris green and slaked lime with a hand bellows to kill the insects, which destroy considerable tobacco every year; harvesting at the proper stage of ripeness; and introducing better methods of curing. The one and most important point, that at present receives no attention, is seed selection. The early set plants having the largest and greatest number of leaves on the stalk should be utilized for seed and all other plants topped. If this were done every year in a short time there would be a uniform shaped leaf and uniform stand of plants in the fields, which would not only increase the yield, but also the percentage of the best grades of tobacco.

MONTHLY VETERINARY REPORTS—APRIL AND MAY.

During the past month there has been a marked improvement in the rinderpest situation in the Southern Islands.

The infected provinces of Luzon in which it has been possible to place a sufficient force of veterinarians and assistants have shown improvement, but several new centers of infection have been discovered.

Cagayan.—Two municipalities, Aparri and Solana, are infected.

Isabela.—There are no known infected localities in this province, although disease may be expected to reappear as a result of the recent infection.

La Union.—This province has at present two infected municipalities, but the disease has been well under control and only a few cases have occurred.

Mountain Province.—One case of rinderpest has been discovered in the Mountain Province just across the boundary line from the Province of La Union. This case undoubtedly resulted from the infection in the adjoining Province of La Union. Immediate steps were taken to eradicate this infection in the Mountain Province and it is believed that no more cases will occur.

Pangasinan.—The large force that was carrying on the rinderpest campaign in Pangasinan at the time of the last monthly veterinary report is still maintained in this province and the work is now beginning to show results. There are still practically the same number of infected municipalities, but the principal centers of infection have been discovered and quarantined. This should result in the reduction in the number of infected barrios during the next month.

The rinderpest outbreak in Pangasinan Province has been one of the most sweeping outbreaks that has occurred for some time. Beginning in the western part of the province it gradually extended eastward and threatened at one time to extend over the entire Island of Luzon. This it possibly would have done had it not been for the timely and valuable assistance rendered by the Philippine Scouts in maintaining quarantine.

Tarlac.—No important changes have taken place in this province during the past month, although the infected area is slightly larger than at the time of the preceding report.

Pampanga.—There has been a marked improvement by the reduction of a number of cases in infected barrios. Although several municipalities are still considered infected, there have been very few cases of rinderpest in this province during the past two weeks.

Bulacán.—The situation in this province is practically the same as a month ago.

Zambales.—Rinderpest was first reported in the municipality of San Narciso. Upon investigating this report several cases of the disease were discovered. An inspection of the neighboring municipalities was made and it was found that San Antonio, San Felipe, and San Marcelino were also infected. As this province has been free from disease for a considerable length of time, it is probable that the infection was carried from the Province of Pangasinan by some coastwise sailing craft.

Bataan.—Rinderpest has existed in the municipality of Dinalupihan during the entire month.

Cavite.—Rinderpest has appeared during the month in three municipalities.

La Laguna.—Rinderpest has recently appeared in the municipalities of Mabitac, Sinaloan, and Santa Maria.

Rizal.—During the month rinderpest has been discovered in three more municipalities, but only one of these municipalities has suffered any considerable loss.

Cebu, Leyte, and Surigao.—There has been no material change in the rinderpest situation in these provinces during the month.

Misamis.—Rinderpest has again appeared on the Island of Mambajao.

Bohol.—No cases of rinderpest have been discovered since March 30 and this island is considered to be free from the disease.

Iloilo.—Only one municipality of this province is considered infected, and in this municipality there have been no cases for several days.

Oriental Negros.—There has recently been a remarkable improvement in the situation in this province. Only four municipalities are now known to be infected, and in two of these there have been no cases for several days. Since the latter part of March there have been about 300 Scout troops on duty as quarantine guards in the Provinces of Oriental Negros and Cebu, the majority of which have been in Oriental Negros. The arrival of the Scouts was followed by a noticeable improvement in the situation in Oriental Negros, and undoubtedly its present condition is largely due to the work of these troops.

MONTHLY CROP REPORTS—APRIL AND MAY.

ABACÁ.

Batangas.—The price of abacá, of which Lipa, Cuenca, and Tanauan raise some quantity, has gone up 50 per cent. The province as a whole is in a more prosperous condition than at any time since American occupation.

Mindoro.—Abacá is doing well in this province.

Misamis.—In the past abacá was the chief and most profitable crop in this province. On account of the low prices paid for abacá during the last two years many people have discontinued its cultivation and have taken up the cultivation of coconuts instead.

Moro Province (Davao).—The output of abacá is continually increasing, and agricultural conditions are very satisfactory. One concern in this district shipped over 1,000 piculs during March, which was one month's harvest and purchase. The three plantations at Lais, Malita, and Lacaron shipped a total of 600 piculs in March. The steamship *Brutus* on April 6 was loading approximately 4,000 piculs. As abacá is the staple article of commerce in Davao, it can be seen that conditions in this district are satisfactory. Twenty abacá cleaning machines are expected in the near future, and if these machines are a success it is expected that the output of hemp will be materially increased and that commercial conditions will be greatly improved.

Occidental Negros (northern section).—About 10,000 piculs of abacá will be harvested in the northern part of this province during the present year. The lack of stripping machines results in considerable abacá that is grown not being harvested. This province produces a good grade of fiber for which there is an excellent demand in Iloilo.

Occidental Negros (southern section).—About 1,200 piculs of abacá will be harvested during the year. Difficulty is experienced in handling this crop because of lack of labor.

Samar.—The price of abacá is fair and quite an amount is being stripped and sold.

COCONUTS.

Mindoro.—Coconuts are doing well in this province.

Misamis.—There are many extensive coconut plantations in this province, from which a considerable revenue is derived. The present price of copra is ₱8.50 per picul. This business is so profitable that new plantations are being started.

Occidental Negros (northern section).—There has been practically no increase or decrease in this crop as compared with last year. The crop from June, 1910, to March, 1911, is estimated at about 3,500 piculs.

Occidental Negros (southern section).—It is estimated that 5,000 piculs of copra will be harvested. The high price of this product is encouraging many people to plant coconuts in this section.

CORN.

Bohol.—There was sufficient rainfall during the month of April and young corn, where it has been planted, is in a thriving condition. Considerable damage has been done to the corn crop in certain parts of this island by monkeys.

Cagayan.—Corn is the staple food of the larger part of the people in this valley, and the present crop is totally insufficient to supply the needs of the people. The corn is suffering severely from drought.

Cebu.—During the months of April and May the principal crop of corn in this province is planted, and a great deal was being planted during the latter part of April. The price of corn in the vicinity of Cacar is ₱4.50 per cavan.

Ilocos Sur.—The corn crop in Abra is less than last year, due to the severe wind storms occurring from October to November.

Isabela.—In Cabagan Nueva and Tumauini the corn crop has received a severe setback due to the excessive dry weather, and many fields of corn wilted down before blossoming. In Cauayan, Tagle, and Echague corn is in fine condition.

Mountain Province (Apayao).—Some of the farmers are just planting corn while others have it in the roasting-ear stage. The corn which is in the ear is very poor, having small ears and being only about 1 meter high.

Occidental Negros (northern section).—The corn crop has been small on account of the November typhoon. It is estimated that 250,000 cavans will be harvested.

Occidental Negros (southern section).—This crop is of little importance, the entire amount of corn harvested in the southern

part of the province being about 50,000 cavans. Corn is a staple food product in the northern part of the province but not in the southern.

RICE.

Ambos Camarines.—The rice crop is beginning to ripen in Camarines Norte and bids fair to be the largest that has been harvested in that section for many years. Not only has the area planted been greater than during any year since American occupation, but the crop is said to be much better than usual and has not been molested by the many enemies of rice. Harvesting is nearly over in the central part of the province and the crop seems to have been light, although the area planted was larger than that planted last year.

Bohol.—Most of the people in the interior are busy gathering their rice crop. Considerable difference of opinion exists in regard to the present rice crop. The crop has been practically all harvested and the yield is estimated to have been better than last year, especially in the towns of Bilar and Batuan. These two towns could easily furnish all of the rice for the entire coast, but the owners of the land do not cultivate all of their land, both on account of the scarcity of work animals and because of the difficulty in the transportation of their products to the coast towns.

Isabela.—In Santiago the early plantings of rice have been cut and yielded a good crop. All of the later plantings, however, have been killed out by lack of water. Considerable rice is now coming in to Echague from Nueva Vizcaya. This product is selling for ₱11 per carga (32 gantas) in the local market.

La Laguna.—The second rice crop is flourishing.

Mindoro.—Preparation is being made to plant a big crop of rice.

Mountain Province (Apayao).—Land from which tobacco has been removed is now being prepared for rice. Rice is also being planted on the same land with corn. All of the rancherias on the Apayao river have cleaned considerable land on the hillsides for this year's rice crop.

Occidental Negros (northern section).—The rice crop is small in this section and will hardly amount to 75,000 cavans, owing to the late rains of last year and to the typhoon which devastated this part of the province in November.

Occidental Negros (southern section).—This crop has suffered from long droughts, and it is estimated that the crop will be only about 150,000 cavans. There is a large demand for rice at the

present time and scarcity of labor to harvest the crop, so that prices are high.

Samar.—The price of rice on the east coast has risen to ₱7.50 per sack, owing to the fact that unfavorable winds have kept the smaller craft of the Chinese merchants from plying along the coast, and therefore from supplying municipalities and barrios of that section with rice. The rice fields are in excellent condition and an extraordinarily good crop is expected.

SUGAR CANE.

Batangas.—Sugar cane, which is the principal crop of practically all the municipalities of the province with the exception of Tanauan and Santo Tomas (where oranges come first and sugar second), has given a very good yield with the unprecedented price ₱7.80 per picul reached.

Bohol.—The condition of the sugar-cane crop early in April was not satisfactory because of an excess of rain. The yield of sugar cane has not been as good as was expected.

Cebu.—A comparatively good crop of sugar cane is being cut during this season.

Ilocos Sur.—Sugar cane is still being harvested in certain sections of the province. The price is low, being about ₱2.50 a picul. One sugar planter in this province has hired men from Negros to show the people how to make clean, white, fine sugar. At least 50,000 piculs of sugar have been shipped from Candon and 20,000 from Solbeck, Narvacan.

Iloilo.—In the central part of the province where sugar is the main crop the work for the last month has been almost altogether devoted to the planting and cultivating of sugar cane. A small amount of cane has been planted in the southern part of the province. Many new sugar plantations are being opened up.

La Laguna.—The cane growers fear that it will be impossible to mill their entire crop on account of inadequate milling facilities and the recent rains. All of the planters report an abundant yield and superior quality of sugar.

La Union.—The sugar crop is larger this year than it has been during previous years, it being estimated that 7,800 piculs of sugar will be harvested. With present sugar prices no other crop pays as well, and each year will, no doubt, see an increase in this industry.

Nueva Ecija.—The sugar crop in this province for the past season has been good.

Occidental Negros (northern section).—There would be no risk in stating that in this province the present year will show an increase of 10 per cent in the sugar crop. As the sugar crop for this section of the province last year was about 519,700 piculs, the crop for the present year will not be less than 571,670 piculs. The scarcity of labor is felt everywhere owing to the increased planting of cane.

Occidental Negros (southern section).—It is estimated that the sugar crop for this part of the province will be about 747,500 piculs. Encouraged by the hope of better prices many of the sugar planters have attempted to carry on operations more extensive than was practicable with the means at hand. As a result there is a possibility that some of the sugar cane fields will not be harvested.

TOBACCO.

Cagayan.—The agricultural outlook is very poor. This year's tobacco crop promises to be one of the poorest in many years.

Ilocos Sur.—Tobacco in Abra is at least 3 per cent more than last year. A great deal more has been planted and the yield is above the average.

Iloilo.—Tobacco looks exceptionally well and there seems to be more planted this year than is usual. In the central part of the province where about all of the tobacco is raised it is noticeable that practically all of this crop is in very good condition.

Isabela.—In Cabagan Nueva and Tumauni tobacco has suffered severely from dry weather, all of the tobacco being small and badly worm eaten.

In Ilagan and Gamu there will probably be a fair tobacco crop.

In Cauayan, Tagle, and Echague there is a fine stand of tobacco, which is exceptionally free from worms and disease, although in Echague a number of fields of tobacco have been entirely destroyed by what is claimed to be a new disease in this locality. The disease begins on the roots and follows up the stalk. Upon examination it is found that the root just below the surface of the soil is infected with a blight and has a moldy or musty odor. There is a rusty yellowish stain about one-fifth of a centimeter in diameter that begins at the root and follows up the stalk. This stain follows up the midrib of each leaf and as it ascends the leaf droops and dies. The upper leaves on affected plants that have not been reached by this stain appear to be normal. The tobacco crop for 1910, with the exception of

that produced in the municipalities of Gamu and Echague, has been sold and shipped either to Manila or Lalloc, Cagayan. The average price paid for the crop for 1910 was ₱3.50 to ₱4 per fardo.

La Union.—The tobacco crop north of San Fernando will probably fall short, owing to the drought, but in the southern part of the province there will be a good crop.

Mountain Province (Apayao).—In some of the rancherias the people are gathering tobacco, in others it appears to have been planted only a short time. The tobacco crop appears to be in poor condition, the leaves being very small and badly worm eaten.

Nueva Ecija.—The tobacco crop has been good.

Occidental Negros (northern section).—This crop has been far from satisfactory. The November typhoon destroyed a great deal of tobacco so that the entire crop will be about 700 piculs instead of 886, which was the production last year.

Occidental Negros (southern section).—This crop is unimportant in this part of the province, and not more than 100 quintals will be harvested.

MARKET REPORTS.

By KER & Co.

NOTES ON MANILA MARKETS FOR APRIL.

(Based on advices from New York, March 24; San Francisco, March 29; London, March 30; Hongkong, April 25; Iloilo, April 29; Cebu, April 29.)

SUGAR.

Iloilo.—Few transactions have taken place in the interval; we quote No. 1 ₱7.50, No. 2 ₱7, and No. 3 ₱6.25 per picul.

Manila.—Business done basis ₱6.50 per picul No. 1, ₱6 No. 2, and ₱5.50 No. 3.

Cebu.—Sellers at ₱7.25 per picul No. 1, ₱6.75 No. 2, and ₱5.75 No. 3.

HEMP.

Market has continued dull; we quote fair current for America ₱7.75 and for United Kingdom ₱7.50 per picul f. o. b. Values of better grades have dropped smartly to basis ₱15 per picul good current f. o. b. Receipts at all ports for the four months are 457,031 bales against 419,265 bales 1910 and 409,593 bales 1909.

COPRA.

Firmer with buyers at ₱9.75 per picul Manila fair merchantable and ₱10.25 Cebu fair merchantable sun dried f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE FOUR MONTHS JANUARY TO APRIL, 1911.

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Singapore.
Dry sugar (tons) -----	30,025	9,479	3,800					
Hemp (bales) -----	159,588	3,400	21,351	171,872	38,287	8,208	10,182	3,335
Copra (piculs) -----	8,400		60,000	18,400	351,898		500	
Cigars (thousands) ----	1,979	10,861	4,475	4,390	3,006	3,143	272	4,837

MANILA FIBER MARKET.

Manila hemp receipts and shipments.

(Telegram from Manila to London, May 8, 1911.)

	1911	1910
	<i>Bales.</i>	<i>Bales.</i>
Hemp receipts at Manila since January 1.....	377,159	341,644
Hemp receipts at Cebu, etc., since January 1.....	108,186	111,529
Hemp receipts at all ports since January 1.....	485,345	453,178
Shipments to United Kingdom by steamer, cleared since January 1.....	198,372	142,323
Shipments to Atlantic coast, United States, by steamer, cleared since January 1.....	138,190	172,662
Shipments to Pacific coast, United States, by steamer, cleared since January 1.....	54,984	42,893
Shipments to Continental ports, by steamer, cleared since January 1.....	44,772	18,734
Shipments to all other ports.....	26,575	
Local consumption since January 1.....	4,000	
	30,575	26,603
Loading steamer on the berth for the United Kingdom, about.....	15,000	42,500
Loading steamer on the berth for Atlantic coast, United States, about.....	18,000	16,000
Loading steamer on the berth for the Pacific coast, United States, about.....		1,000

Bales of hemp loading for United Kingdom, by steamer Moorlands..... 15,000

Bales of hemp loading for United States:

By steamer Sandon Hall..... 8,000

By steamer Strathtay..... 6,000

By steamer Matoppo..... 4,000

ILOILO SUGAR MARKET FOR APRIL.

By FIGUERAS HERMANOS.

Exports up to April 30, 1911.

(In piculs.)

To—	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet.
United States.....	424,800		386,000	
China.....	64,575	486	135,972	29.38
Total.....	489,375	486	521,972	29.38

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING DECEMBER 31, 1910.

By WM. D. HOBART, *Statistician.*

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unbulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Agusan:		<i>Hectares.</i>	<i>Hectares.</i>		
Rice -----	Good -----	487	200	315,750	Liters.
Abacá -----	do -----	710	1,083	273,788	Kilos.
Copra -----	do -----			15,000	Do.
Corn -----	Fair -----	47	30	60,000	Liters.
Albay:					
Rice -----	Good -----	8,461	11,774	10,048,900	Do.
Abacá -----	do -----	295	23,168	4,661,770	Kilos.
Copra -----	do -----			494,767	Do.
Sugar cane -----	do -----	51	105	66,484	Do.
Corn -----	Fair -----	127	96	56,385	Liters.
Ambos Camarines:					
Rice -----	do -----	21,376	8,046	8,702,746	Do.
Abacá -----	Good -----	337	9,535	1,871,228	Kilos.
Copra -----	do -----			261,056	Do.
Sugar cane -----	Fair -----	184	209	120,355	Do.
Corn -----	do -----	191	86	68,088	Liters.
Antique:					
Rice -----	do -----	107	21,493	22,390,614	Do.
Abacá -----	do -----	22	32	10,159	Kilos.
Sugar cane -----	do -----	288	46	62,698	Do.
Copra -----	do -----			24,975	Do.
Corn -----	do -----	26	1	300	Liters.
Bataan:					
Rice -----	do -----	5	2,368	5,144,847	Do.
Sugar cane -----	Good -----		2	5,692	Kilos.
Corn -----	Fair -----	9	184	150,075	Liters.
Batangas:					
Rice -----	do -----	709	14,842	11,159,790	Do.
Abacá -----	do -----		252	34,028	Kilos.
Copra -----	do -----			13,409	Do.
Sugar cane -----	do -----	210	15	10,115	Do.
Corn -----	do -----	1,507	174	52,250	Liters.
Bohol:					
Rice -----	do -----	15,697	18,930	16,327,668	Do.
Abacá -----	do -----	20	772	213,618	Kilos.
Copra -----	Good -----			885,229	Do.
Sugar cane -----	do -----	120	96	70,070	Do.
Corn -----	Fair -----	1,679	1,412	582,585	Liters.
Bulacan:					
Rice -----	do -----	4,105	15,709	30,485,625	Do.
Sugar cane -----	Good -----	219	9	5,100	Kilos.
Corn -----	Fair -----	1,207			
Tobacco -----	do -----	685			
Cagayan:					
Rice -----	do -----	3,429	5,597	6,588,200	Liters.
Sugar cane -----	do -----	80	105	59,125	Kilos.
Corn -----	do -----	1,102	1,252	1,465,856	Liters.
Tobacco -----	do -----	2,654	801	1,924,546	Kilos.
Capiz:					
Rice -----	do -----	13,831	53,724	48,572,437	Liters.
Abacá -----	do -----	151	972	200,126	Kilos.
Copra -----	do -----			292,985	Do.
Sugar cane -----	do -----	33	224	94,709	Do.
Corn -----	do -----	90	191	49,417	Liters.
Tobacco -----	do -----	297			

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Cavite:		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Fair	2,686	6,421	10,016,099	Liters.
Abacá	Good		370	71,585	Kilos.
Copra	do			10,436	Do.
Sugar cane	Fair		95	109,968	Do.
Corn	do	1,038	80	79,178	Liters.
Cebu:					
Rice	Fair	694	2,334	2,167,830	Liters.
Abacá	Good	4,700	940	181,191	Kilos.
Copra	do			718,375	Do.
Sugar cane	Fair	2,520	599	475,839	Do.
Corn	do	28,389	25,361	16,569,240	Liters.
Tobacco	do	3,950	3	132	Kilos.
Maguey	do	153	761	239,250	Do.
Ilocos Norte:					
Rice	do	15	40,053	68,891,116	Liters.
Sugar cane	do	481	706	886,240	Kilos.
Corn	do	212	114	157,650	Liters.
Tobacco	do	452			
Ilocos Sur:					
Rice	do		39,720	59,045,930	Do.
Sugar cane	Good	131	465	550,374	Kilos.
Corn	do	1,276	25	37,500	Liters.
Tobacco	Fair	415			
Maguey	Good	8	195	214,099	Kilos.
Iloilo:					
Rice	Fair	14,252	39,086	23,373,245	Liters.
Abacá	Good	108	426	80,960	Kilos.
Copra	do			32,756	Do.
Sugar cane	do	255	415	475,794	Do.
Corn	Fair	42	67	105,494	Liters.
Isabela:					
Rice	do	310	1,486	1,454,900	Do.
Corn	do	494	1,471	934,500	Do.
Tobacco	do	6,528	6,699	2,601,167	Kilos.
La Laguna:					
Rice	do	2,000	2,957	4,645,600	Liters.
Abacá	do	2	268	151,780	Kilos.
Copra	do			2,555,235	Do.
Corn	do	146	239	141,165	Liters.
La Union:					
Rice	do		30,041	44,698,225	Do.
Copra	Good			3,444	Kilos.
Sugar cane	Fair	114	133	167,060	Do.
Corn	Good	509	264	122,907	Liters.
Tobacco	Fair	2,303			
Leyte:					
Rice	do	3,006	12,968	8,497,141	Do.
Abacá	Poor	1,169	22,505	5,360,475	Kilos.
Copra	do			995,686	Do.
Sugar cane	Fair	133	672	1,013,119	Do.
Corn	Poor	1,851	2,222	963,875	Liters.
Tobacco	Fair	104	326	105,742	Kilos.
Mindoro:					
Rice	do	14	4,909	7,364,569	Liters.
Abacá	Good	37	334	123,187	Kilos.
Corn	Fair	31	43	35,325	Liters.
Tobacco	do	163			
Misamis:					
Rice	do	740	3,847	6,101,775	Do.
Abacá	do	7	7,549	1,636,889	Kilos.
Copra	Good			493,245	Do.
Corn	Fair	275	1,909	1,648,700	Liters.
Moro:					
Rice	do	3,758	2,770	4,267,360	Do.
Abacá	Good	181	6,358	1,793,292	Kilos.
Copra	do			1,045,413	Do.
Corn	do	34	116	157,675	Liters.
Mountain:					
Rice	do	427	9,466	14,391,726	Do.
Tobacco	Fair	32	7	3,762	Kilos.
Coffee	do	41	116	12,521	Do.
Nueva Ecija:					
Rice	Good	675	38,862	84,003,365	Liters.
Sugar cane	do	292	253	425,064	Kilos.
Corn	Fair	357	32	23,250	Liters.
Tobacco	do	1,194			

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Nueva Vizcaya:		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Good	315	126	114, 975	Liters.
Sugar cane	do	15	2	1, 881	Kilos.
Tobacco	do	182			
Occidental Negros:					
Rice	Fair	204	18, 561	25, 719, 825	Liters.
Abacá	Good	37	648	192, 610	Kilos.
Copra	do			377, 431	Do.
Sugar cane	do	7, 804	4, 498	10, 531, 925	Do.
Corn	do	489	939	865, 500	Liters.
Tobacco	Fair	324			
Oriental Negros:					
Rice	do	379	772	774, 150	Do.
Abacá	do	1, 795	334	214, 023	Kilos.
Copra	Good			693, 831	Do.
Sugar cane	Fair	312	250	302, 073	Do.
Corn	Poor	4, 832	6, 768	4, 335, 561	Liters.
Cacao	Fair	185	43	2, 762	Kilos.
Palawan:					
Rice	do		1, 826	1, 931, 475	Liters.
Copra	Good			30, 778	Kilos.
Sugar cane	do		6	4, 111	Do.
Pampanga:					
Rice	Fair	4, 272	23, 147	26, 671, 325	Liters.
Sugar cane	do	3, 661	6, 175	9, 608, 947	Kilos.
Corn	do	76	181	55, 250	Liters.
Tobacco	do	111			
Pangasinan:					
Rice	do	10, 965	131, 415	203, 716, 280	Do.
Copra	Good			282, 426	Kilos.
Sugar cane	do	377	1, 037	1, 364, 774	Do.
Corn	Fair	716	1, 336	1, 078, 870	Liters.
Tobacco	do	5, 004	9	3, 590	Kilos.
Rizal:					
Rice	Good	40	11, 585	19, 111, 975	Liters.
Sugar cane	Fair	29	208	156, 860	Kilos.
Corn	Good	148	243	195, 580	Liters.
Samar:					
Rice	Fair	5, 480	3, 160	2, 373, 278	Do.
Abacá	do	1, 012	7, 543	2, 013, 547	Kilos.
Copra	Good			843, 704	Do.
Sugar cane	Fair	170	415	256, 563	Do.
Corn	Good	1, 161	148	174, 606	Liters.
Tobacco	do	149	313	13, 773	Kilos.
Sorsogon:					
Rice	Fair	7, 839	1, 928	1, 664, 565	Liters.
Abacá	Good	323	23, 950	5, 547, 146	Kilos.
Copra	Fair			295, 743	Do.
Sugar cane	do	47	195	244, 248	Do.
Corn	do	382	243	113, 640	Liters.
Surigao:					
Rice	Good	6, 773			
Abacá	Fair	200	1, 473	532, 619	Kilos.
Copra	Good			102, 607	Do.
Sugar cane	Fair	25	3	13, 500	Do.
Corn	do	54	1, 075	1, 556, 030	Liters.
Tobacco	do		63	31, 404	Kilos.
Tarlac:					
Rice	do	25, 777	37, 623	40, 674, 075	Liters.
Sugar cane	do	934	7	1, 170, 800	Kilos.
Corn	Good	26		14, 400	Liters.
Tobacco	do	114			
Tayabas:					
Rice	do	5, 470	14, 514	12, 164, 129	Do.
Abacá	do	17	423	106, 156	Kilos.
Copra	do			3, 597, 073	Do.
Sugar cane	do	57	985	1, 037, 582	Do.
Corn	Fair	45	131	55, 045	Liters.
Zambales:					
Rice	do	777	10, 925	13, 908, 421	Do.
Copra	do			17, 710	Kilos.
Sugar cane	do	42	78	124, 512	Do.
Corn	Good	31	12	8, 850	Liters.

NOTE.—Statistics are kept of the number of coconut trees, so the number of hectares harvested can not be shown.

Highest and lowest prices of unhulled rice, abacá, copra, sugar, tobacco, and corn for the quarter ending December 31, 1910.

[NOTE.—75 liters = 1 cavan; 63.25 kilos = 1 picul; 46 kilos = 1 quintal; 11.5 kilos = 1 arroba.]

Province.	Unhulled rice per 75 liters.		Abaca per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	3.75	1.50	10.12	8.09	9.49	8.85					5.25	2.00
Albay	3.75	1.87	8.86	5.06	13.50	8.06					3.00	1.50
Ambos Camarines	4.50	1.50	8.22	4.50	9.49	5.06					2.25	1.50
Antique	3.00	2.25	18.98	12.00	10.75	7.35					2.50	2.25
Bataan	3.50	2.00										
Batanes	4.50											
Batangas	3.75	2.25	17.00	8.00	13.92	6.33					3.75	2.25
Bohol	4.00	2.25	14.65	8.25	10.12	8.22					4.50	2.25
Bulacan	3.00	2.00									3.00	2.50
Cagayan	5.00	3.37			10.00	5.69					3.75	2.50
Capiz	3.75	2.00	15.72	6.33	10.00	5.69					3.75	2.50
Cavite	3.37	1.87	18.00	14.55							4.00	2.25
Cebu	5.25	1.50	15.18	9.49	11.39	5.06					4.50	1.77
Ilocos Norte	4.50	2.50									3.00	1.50
Ilocos Sur	5.00	2.25									3.20	2.00
Iloilo	4.05	2.25	16.81	12.65	12.65	6.33					5.25	3.50
Isabela	5.00	3.75									3.00	1.50
La Laguna	3.00	2.25	15.81	6.31	9.50	6.96					4.00	1.50
La Union	3.75	1.50			12.65	8.22					5.25	1.40
Leyte	5.25	2.00	14.00	5.06	12.65	6.33					2.25	2.25
Mindoro	3.00	2.50	15.50	9.49							3.00	2.25
Misamis	3.75	1.50	12.00	4.11	9.50	5.69					4.50	1.87
Moro	3.75	1.50	15.00	6.32	9.49	6.96					6.00	1.50
Mountain	6.00	2.00									3.75	1.75
Nueva Ecija	4.20	1.25									5.00	2.25
Nueva Vizcaya	3.75	3.12									3.75	1.50
Ocidental Negros	3.05	1.87	17.08	6.32	12.02	8.00					3.75	1.50
Oriental Negros	5.00	2.25	15.18	5.70	10.75	6.96					3.75	2.00
Palawan	3.00	3.00			9.50	5.06					5.00	2.25
Pampanga	3.25	2.20										
Pangasinan	4.50	1.50									3.75	1.50
Rizal	3.37	1.50									3.00	1.50
Samar	5.25	2.25	16.00	7.59	9.49	6.33					4.50	1.50
Sorsogon	5.00	1.87	13.92	5.06	9.49	6.33					4.00	1.50
Surigao	4.50	2.50	12.65	5.69	10.75	8.22					2.50	2.00
Tarlac	4.00	1.50									2.00	1.87
Tayabas	5.25	1.50	11.39	5.69	9.00	5.69					5.00	1.50
Zambales	5.00	1.25									4.50	3.75

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

APRIL, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.					
	Albay.		Tacloban.						Aparri.		San Fernando.			
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.		
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.		
1	26.8	54.4	26.1	2.3	26.5	2.3	27.2		24.5		27.4			
2	26.4	1	25.1	10.4	26.6		28.2		25.1		28			
3	26.8	8.6	26.1	.5	26.8		28		24.7		26.7			
4	27	3.1	27	3.8	27.4		29.6		24.6	5.1	27.9			
5	27	3.8	25.1	51.6	27	1	28.3		25.3		27.6			
6	27.2		25.3	16.5	26.9		27.8		24.9		28.4			
7	27.2	44.8	25.9	4.8	27.1	2.3	28.2		23.8	.3	27.8			
8	26.1	41.7	27.3		27.8		28.2		25		28			
9	26	14.1	26.2	11.7	28.1	11.2	28.4		25.4	12.5	28.8			
10	27.7	32.7	26.6		28.1	28.2	28.5		25.3		28.8			
11	28		27.3		28.1		29.3		25.9		29.2			
12	28.2		27.4		28.1		29.7		25.9		28.8			
13	28.5		27.4		28.3		30	33	26.1	.5	29.4			
14	28.5		27.3	4.3	28.1		28.9	1.8	25.7		27.6			
15	28.1	1.5	27.6	2	27.1		28		25.9		27.4			
16	26.9	18.8	27.6		27.1	25.9	28.6	3.8	25.7		27.6			
17	27.4		27.5	.5	27.1		29.2		26	20.3	27.8			
18	26.5		27.6	2.8	27.7	1	29.4		23	1.9	27.7			
19	27.5		26.6	4.6	26.4	6.4	28		24.9		28.5			
20	28.4		26.3		27.6	1.8	28.2		26.1		29			
21	27.6	12.5	27	2	25.7	4.8	29.3		26.5		29			
22	25.4	52.8	23.3	38.4	25.7		28.9		26.1	.5	29.7			
23	26.3		25.8	8.4	26.5	2.8	26.7	15.2	26.1	3.8	28.8			
24	27.3		27.2		27	2.3	26.4	3.8	26.7	22.6	26	3.5		
25	27.6		28.2	1.5	27.5	11.2	27.5	29.2	25.9	20.1	26.6	20.8		
26	27.5		27.6		27.2		27.8	5.1	26.7	26.6	26.6	25.9		
27	27.9		27.6	2.5	27.7		26.5	22.9	25.3	6.4	27.4	31.2		
28	26.6	1	27.2	16.5	28.2		27.8	1.3	25.7	9.7	27			
29	27	.3	28.3		26.5		28.2		26.3	4.3	27.5			
30	26.5	5.9	27.4	1.3	26.2	5.1	28.2		27		27.7			

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EDITORIAL.

THE RINDERPEST PROBLEM.

It is probable that many of the readers of the REVIEW, as well as a large part of the general public in these Islands, look upon rinderpest as an affliction from which the Philippines have suffered to a greater extent than any other part of the world. To such as hold this opinion the article on rinderpest by the chief veterinarian of the Bureau of Agriculture, published in

this number of the REVIEW, will be enlightening and of peculiar interest.

This disease which has caused such stupendous losses in these Islands and which is still prevalent in many provinces has existed since the earliest dawn of history. It has been carried across the seas and has swept over practically entire continents, destroying untold millions of animals.

It is well to consider in this connection that the people of the Philippine Islands in their attempt to control and eradicate rinderpest are not facing a new and untried problem, but rather a problem that has been met and that has been solved many times and in many different lands. In other countries where rinderpest has been widespread the disease has been completely eradicated and there is no reason why the same results can not be accomplished in the Philippines.

On the other hand it should be noted that the existing conditions in these Islands are such as to render the complete eradication of rinderpest an exceedingly difficult and possibly a long task. The infection is spread over enormous unfenced areas where the complete control of the movement of domestic animals is neither practicable nor possible. In many localities the people even yet do not fully understand the urgent necessity for loyal and hearty coöperative effort in the work of disease eradication.

That which marks progress in the rinderpest campaign is not so much a lessening of the number of known centers of infection as it is the changing attitude of the people toward this work. Although in some instances the desired result has come slowly there has been, nevertheless, a steady improvement in this direction. Provincial and municipal officials, as well as the owners of live stock, are coming to realize that some temporary hardship is worth the while in view of the final results to be obtained. When this attitude becomes general throughout the Islands and when complaints and *reclamors* are generally superseded by active and intelligent coöperative effort the end of rinderpest will be in sight.

VEGETABLE GARDENS IN THE PHILIPPINES.

A noticeable feature of rural life throughout the length and breadth of the Philippines is the almost utter absence of well-kept vegetable gardens. This condition is particularly unfortunate because of the fact that there are many excellent vegetables that can be grown in almost any part of the Islands. It

is unfortunate, furthermore, for the reason that the daily diet of a large majority of the people is extremely restricted in variety at the present time and would be greatly improved by the addition of the products of a good garden.

It is probably of more interest to consider the means of improving the present situation rather than the reasons why this situation exists. In two different articles in this number of the REVIEW vegetable gardening in the Philippines is discussed at some length by men who have had practical experience in the work. In both of these cases the results, as a whole, that were obtained were highly satisfactory.

The gardener in any land has difficulties to face and obstacles to overcome and in some parts of the Philippines the difficulties may seem to be numerous and the obstacles large. Reports of successful gardening are, however, becoming more and more numerous and as these reports cover a territory extending from the Batanes Islands in the north to Mindanao in the south it appears that good gardens are a possibility in almost any part of the Islands.

It is difficult to overestimate the value of the work that can be and is being done by the Bureau of Education in its school gardens. In these gardens a large number of boys and girls are learning some of the elementary principles of successful agricultural work. The information thus obtained will be widely disseminated and if the work is actively continued and intelligently supervised the school garden may well be the means of bringing about a large increase and a great improvement in the present food supply of the people of these Islands.

THE LOCUST SITUATION.

As the time of year is now approaching when locust swarms may be expected in different parts of the Islands it is important that measures be taken to promptly and effectively fight this pest when it appears. Last year there was a great deal of excellent work done in this direction. In the Province of Iloilo particularly, such an active campaign was carried on against locusts that the methods used in this province were brought to the attention of local Government officials throughout the Islands.

Considerable investigational work has been carried on to determine the best means of destroying locusts, as a result of which it is believed that under existing conditions the most

satisfactory results will be obtained by the use of the common method of driving them into trenches. This method is simple, one with which all of the people are familiar and one that requires no complicated or expensive apparatus. The use of poisons, while effective, is attended with more or less danger in this country and can only be introduced gradually.

The first consideration in the work of exterminating locusts is promptness, and the second is concerted effort. The driving of a swarm of locusts to an adjoining plantation or to the next municipality does not greatly improve the general situation. It is essential, therefore, when locust swarms appear that the people, not only in one locality, but, if necessary, of several adjoining municipalities act together with the end in view of the complete destruction of the pest.

THE RINDERPEST PROBLEM.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

Rinderpest is primarily a disease of Asia. It is distributed at present from the China Sea to the Urals and the Black Sea. It has existed in that continent from the time of writing the earliest authentic records to the present moment. The spread of no other animal disease is so closely identified with great migrations of peoples, war and commerce, as is rinderpest. There are precise accounts of the appearance of the disease in Europe from time to time during the past fourteen hundred years. It was spreading westward from the banks of the Don and Volga at the time Theodosius in Constantinople was repulsing the Goths. Charlemagne took the disease back to the territory now known as France after his expedition against the Danes in 810. It is thought probable that during the known history of the disease a period of fifty years rarely elapsed without a visitation of some portion of Europe.

In the later centuries, data is available concerning the losses. In the second half of the eighteenth century it carried off 200,000,000 head of cattle in Europe. During the Napoleonic wars it caused unheard of losses through Europe. The last invasion of England occurred in 1865-66, when in eighteen months 279,023 head were reported as attacked, of which 40,165 recovered.

It should be emphasized that the conditions in Europe during these periodic invasions were such that the disease either burned itself out for lack of susceptible animals or was controlled by sanitary measures after each invasion. The disease did not gain a permanent foothold, and the historic facts bear evidence to the truth of the fact that it is a disease that can be exterminated in any given area. The losses in Europe in ancient times were due to introduction of disease from the great reservoir of rinderpest, the vast unfenced areas of Asia, where the disease constantly exists among the herds roaming therein. In

Europe, where the movement of cattle is restrained, the disease gained but a transitory foothold.

The demands of commerce, rather than war, have resulted in the infection of the Philippines by importation of cattle from Hongkong, and only a year ago were those demands denied by measures designed to exclude the disease. Until that time efforts to control the disease here were of necessity futile.

The experience of ages has demonstrated that the disease can be exterminated by preventing the intermingling of sick or suspected animals with the well; by the slaughter of the sick and exposed, together with thorough disinfection. By these methods Europe has been rid of the disease.

During the past fifteen years a great deal of effort has been exerted toward controlling the disease with antitoxic serum. This serum has been employed extensively in Asia, Africa, and in the Philippines. A critical study of the results that have attended its use here and elsewhere has led to the abandonment of this means of combating the disease here. It is not possible to ascribe to serum the credit of exterminating the disease unaided by other measures in a single country where it has been used. Rinderpest is a disease that must be fought to extinction.

In all fenced countries, rinderpest is successfully combated by slaughtering all of the sick and the exposed cattle in contact with them. In such thickly settled countries, the problem of discovering infected herds is comparatively simple, as is likewise the matter of determining what animals are really exposed. Under the conditions existing in the Philippines, the determination of these facts is one of extreme difficulty. The offer of compensation to owners of sick cattle slaughtered by no means always results in cases being voluntarily reported by the owners.

There is frequently cherished a hope that the animal will survive the attack. Furthermore, the carabao is frequently a family pet and there is a strong sentimental objection to its slaughter. Where slaughter has been employed in the Philippines, it has been noted that sick cattle have in general been reported only when on the verge of death, a time when they have done practically all the damage possible in the way of disseminating disease. Under such conditions the contact animals are hopelessly scattered by the owners in order to avoid quarantine restrictions. Under any circumstances it is practically impossible to determine the contact animals.

Slaughter has so far been employed to a limited degree under practically experimental purposes to determine its efficiency.

The present methods of controlling rinderpest employed by the Bureau of Agriculture, are centered about the task of finding the sick and of keeping separated from one another the various animals which are susceptible to this disease. These include cattle, carabaos, sheep, goats, and possibly pigs, under certain conditions. Inasmuch as the disease is prevalent in seventy-one municipalities in twenty provinces in these Islands, the task has to be taken up piecemeal. While the fundamental principle of the campaign is simple, it is by no means a simple task to enforce the separation of animals under the conditions existing in the Philippines. It is not too much to claim that the task of eradicating rinderpest here is one that has no successful precedent under similar conditions elsewhere. In the unfenced countries of Asia the disease flourishes to-day as it has since the writing of the earliest records. The Island of Luzon constitutes the most difficult problem on account of its size and the overland movement of cattle and carabaos. There is an extensive movement of cattle from the Province of La Union and territory northwards and from the mountains in the western portion of Pangasinan southwards as far as Manila. This is a movement of cattle from the prosperous breeding districts to supply losses in the great central valley. Besides this, there are extensive trade channels permeating the provinces between Ilocos Norte and Rizal. The movement of animals is further intensified from the fact that there is the seasonable movement of work animals from one part of Luzon to another, depending upon crop harvesting, planting, etc. Persons familiar with the customs of the country need not be told that this movement of animals through Luzon goes on without reference to roads, trails, or bridges, and is, if anything, more active at night when the difficulties of preventing movement are intensified. The difficulties of controlling the movement of animals by sea are likewise serious. It is the common practice to ship animals from place to place in the Islands on very small boats, which are subject to no official regulation. Our quarantines have been evaded by shipment of animals by water on the Gulf of Lingayen and on Manila Bay. In a work of this character it is expected that opposition will be encountered which has its origin in both ignorance and deliberate, willful violation of regulations. A campaign of education is being carried on, but its progress is hindered by the difficulties imposed by the differences of race, habits of thought, customs and languages of the people who own the cattle and the people who are fighting the disease.

The theoretically perfect ideal in a task of this character

would be to prevent absolutely the movement in an infected community of all animals of the classes mentioned above, for a period of fifteen days after the last case discovered. Such a measure is of course impossible in an agricultural community at the time of harvesting or planting of crops, for its enforcement would cause staggering losses. The measures, then, represent the compromise between the complete suspension of the movement of animals and of the unrestricted movement of animals. The past system permitting the use of work animals under certain conditions represents the mean between the two possible extremes. How important a matter this question of the issuing of passes becomes is well illustrated by a passage from Gamgee's work on this disease written in England in 1866:

Any plan which, while laying down the general prohibition, admits exceptions in favor of cattle removed to particular places or for particular purposes, must rest upon the ascertainment of facts more or less complicated, to be proved by certificates from local authorities upon the accuracy of which, experience warns us, little reliance can be placed. The liberty to remove cattle for particular purposes is sure to be extended and abused for other purposes. A man has only to proffer an intention in accordance with the law in order, by a little dexterity, to obtain under such a system the utmost facility for violating the law. It will be a long time before the rules are understood, and the period through which they are violated through ignorance will be succeeded by the period in which they are evaded by design. England is probably the worst country in the world for the working of a system of certificates, permits, licences, and passports; and the temptation to violate the rules will be very great, for the thought that naturally occurs to every one whose herd is attacked is to conceal the existence of the disease until he has got rid of those animals which do not yet show symptoms of its presence.

Substitute the words "Philippine Islands" for "England" in the above quotation and we have an expression of the difficulties encountered in the present campaign. I quote this to show that whatever dissatisfaction I may express concerning difficulties in accomplishing our measures these obstacles are not peculiarities of the Filipino people, but are characteristics of livestock owners and dealers the world over.

The infection is so widespread in Luzon that it is possible only to undertake measures of complete eradication in the Province of Pangasinan. This is one of the fourteen infected provinces of this island. The campaign in Pangasinan has been made possible only through the hearty coöperation of General J. Franklin Bell, who has placed extraordinary facilities at the disposal of the Bureau of Agriculture. There are on duty in this province a total of forty-one American soldiers, one thousand one hundred and thirty-six Philippine Scouts,

forty-five Scout officers, and two quartermaster veterinarians, all borrowed from the Army. The Bureau of Agriculture has supplied nine veterinarians and one hundred and eighteen inspectors.

Through the use of the Scouts there is being achieved the combination result of a police patrol (which is an indirect quarantine) and an inspection of animals for evidence of disease. The Scouts are being educated as to the nature and symptoms of rinderpest so that they will be able to diagnose cases, and also are being instructed in the quarantine regulations for their guidance in the quarantine side of their duty. When the Scouts encounter an infected or suspicious animal, they hold the animal until an inspector arrives, who at once assumes the responsibility of diagnosis and disposal of the animal. In patrolling, the soldiers are instructed to move in pairs so that in case they find an infected animal one may mount guard over him until the other returns with an inspector.

At the beginning of the work all newly appointed inspectors were sent to a training school in Lingayen in groups of from ten to twenty-five and were held there until the instructor in charge decided that their knowledge was sufficient to enable them to act intelligently alone. The method of instruction was to conduct them to the corral so that they might see the various stages of the disease and assist at autopsy. They accompanied the trained inspectors during their inspection trips, becoming familiar thus with work both in clean and infected barrios, assisting in taking of animal census, corraling of animals, etc. Evenings were spent in the class room, where the instructor lectured on the laws and regulations, taught them how to make out necessary papers in the proper manner, made them all understand fully the policy of the Bureau and the best methods of getting information, and, in general, discussed with them the obstacles they might be expected to encounter in rinderpest work. The last two days were spent in demonstrating the knowledge of the different appointees by asking questions as to what they would do under certain conditions, and receiving recitations.

On May 13 rinderpest was known to be present in thirty municipalities in Pangasinan with a bovine population of 54,364 animals. Of these, 4,865 were actually in quarantine, a total of 8.9 per cent of the bovine population of the thirty infected municipalities. Figures are available to show that on May 20 there were fifty barrios of the province in quarantine. The total number of barrios in the province is estimated to be

between eight and nine hundred. These figures are quoted to illustrate the truth that the quarantine measures employed in Pangasinan are by no means as paralyzing to agriculture as has been represented. It should be noted that there has been interference with agricultural operations only in the fifty quarantined barrios or portions thereof. That the interference has not been oppressive is shown by the fact that it will be several weeks yet before it is essential that plowing be commenced in Pangasinan.

During the opening weeks of the campaign in Pangasinan the increase in the number of trained men, capable of recognizing the disease, simply increased our list of known infected municipalities. This is a circumstance which I wish to emphasize as illustrating our difficulties in locating infection. After a search which has resulted in showing that practically every municipality in the province was infected the tide has turned and our efforts are now bearing fruit in clean territory. On the 20th of May nine municipalities in the eastern part of the province were released from any restrictions whatever, although inspection work is being continued. In connection with the difficulties in discovering disease it should be emphasized that much unrecognized infection is believed to prevail throughout the territory between Pangasinan and Rizal. This whole stretch of territory is believed to be in a condition differing in no way from that which the search of Pangasinan exposed.

In the Visayan Islands there are only six known infected municipalities. The situation is highly encouraging. Two known infected municipalities in Mindanao raise the total of known infection south of Luzon to eight municipalities. Four hundred Scouts have rendered inestimable service in Oriental Negros during the past two months.

In all of the infected provinces of the Archipelago, the Philippines Constabulary are rendering valuable aid up to the limits imposed by the available men.

The work of the Bureau against rinderpest may be regarded as of two classes: First, palliative measures with the insufficient forces, resulting in widespread benefit throughout the infected areas by lowering the losses; second, systematic efforts at utter extinction of infection.

Under the most favorable conditions, extinction of rinderpest in the Philippines will involve years of work, with occasional heartbreaking setbacks. In this connection the magnitude of the task can best be illustrated by reference to unprejudiced writers elsewhere. The British Royal Commission appointed to inquire

into the origin, nature, etc., of rinderpest, occurring in England in 1865, writes of rinderpest in England as follows:

Against a disease which is highly contagious, undiscoverable at a certain stage, and too widely diffused for an army of inspectors to cope with it, there is clearly but one remedy which will be certain and absolutely effectual. That remedy is to prohibit everywhere for a limited time any movement of cattle from one place to another. Enforce this and within a time which can not last very long the disease is at an end. It must stand still and must starve for want of nutriment. This great sacrifice would certainly eradicate the evil; we can not say so of any sacrifice less than this.

We are perfectly sensible of the vast train of losses and inconveniences, public and private, which must attend upon such a measure; and the possibility of mitigating them by circumscribing a prohibition in different ways without rendering ineffective is a point to which we have given most anxious consideration. * * * We are perfectly sensible that this is a question of extreme difficulty. The difficulty lies in the magnitude of the sacrifices we have to call for, the inadequate notion which prevails of the extent of the evil to be subdued, the facilities for dishonest evasion and the risks from inadvertence which spring up from every attempt to mitigate those sacrifices. For it must be observed that we have not merely to guard against criminal or unscrupulous acts; nothing is easier than for a man, without being guilty of so much as gross negligence, to become the means of spreading the infection over the whole country.

England has now to contend with the rinderpest under disadvantages never experienced by any other country. The density of her population, the large quantity of her horned stock and above all the enormous facilities of communication by railroad make her peculiarly liable to the ravages of a contagious disorder and render the prospect of eradicating it within any reasonable time either by slaughter or by curative or disinfecting measures almost hopeless.

Notwithstanding the pessimistic tenor of the last sentence the disease was eradicated from England within eighteen months of its recognition and that country has since remained clean.

Professor James Law an authority on the subject, makes the following statement regarding the Philippines in his text-book of Veterinary Medicine:

On the unfenced land of these Islands we have to face on a smaller scale the problem of stamping out the plague which has baffled the wisdom of Europe and Asia. * * * But whatever method is adopted the seclusion of all within well-fenced areas is the most important consideration. No nation has ever succeeded in extirpating this nor any other important infection in animals when they are allowed to run at large and mingle freely, herd with herd, on unfenced land.

All of this is quoted not in a spirit of pessimism as to the outcome of the determined effort against the disease now being carried on in the Philippines, but with a desire to furnish the public with accurate information regarding the present rinderpest situation.

A RÉSUMÉ OF THE LOCUST SITUATION.

By D. B. MACKIE, *Agricultural Inspector.*

The purpose of this paper is to record conditions relative to the appearance of locusts in the Philippine Islands. Ever since the organization of the Bureau of Agriculture reports have been received each year relative to the damage done by these insects, and experience has led provincial officials to the conviction that the provinces would be mutually benefited if the work were centralized and placed in the hands of the Insular Government.

The great advantage which a central power would have in combating the pest, as against many provinces working independently, is universally conceded. In this way the same laws would be made applicable to all provinces, and the present evil of swarms allowed to mature by reason of the negligence of municipal and provincial officials of one province and later invading adjoining provinces, which have been kept clean only by hard and conscientious work, will be eliminated. To combat the pest intelligently and successfully, it is necessary that much more knowledge be gained regarding the origin and migration of invading swarms.

The first step taken by the Government to control the locust plague was the passage of Act No. 817 in August, 1903, authorizing and providing for the appointment of locust boards in each province, with full power to call upon all able-bodied inhabitants thereof to take united action to suppress the pest. However, at that time the Islands were subjected to a severe epizootic of rinderpest and all available funds were used to combat that disease. The congressional relief fund was no longer available for fighting locusts and the matter of locust extermination was dropped to give the necessary attention to the more important cattle plague. As the cattle plague continued for the next five years, little was done to mitigate the locust pest, although letters requesting information, and help to destroy the locusts, were received each year during the locust season.

During the season of 1909 the reports of the loss of crops by locusts were very numerous, and in September of that year the Bureau conducted a series of experiments (THE PHILIPPINE AGRICULTURAL REVIEW, April, 1910, "An Investigation of the Locust Pest in the Philippines") to determine the value of methods recommended by other countries, which are periodically subject to invasion by these insects. For those who have not read the above-mentioned article, it may be said that the different methods were all more or less successful, particularly the arsenical spray recommended by the South African Central Locust Board. This mixture is very efficient as a killing agent, and if the people would exercise more care in looking after their live stock, while the poison is being used in the vicinity, it could undoubtedly be used to advantage in the Philippines.

After all of these methods have been tried there are many factors which lead us to believe that, if a concerted campaign were conducted against locusts in these Islands, the native method of driving them into trenches would prove the most satisfactory. The following may be said for it: First, It is the method in vogue and the people all over the Archipelago are familiar with it; second, it is simple; third, it is economical; fourth, a supply of sheet iron may be kept indefinitely.

It was not until 1910 that any active campaign was waged against locusts. Shortly after the publication of the above-mentioned article, the Governor-General issued a circular calling attention to the law of 1903, making the destruction of locusts compulsory, and called upon provincial governors to see that the law was enforced. Although many provinces were short of funds and without material, the manner in which they responded was very commendable, and it is safe to say that during the season of 1910 there were more locusts killed in the Philippine Islands than in any two years preceding.

The reports received have been of great value; from them we have been able to ascertain the number of provinces invaded, the areas of greatest infestation, the apparent movements of invading swarms, the equipment of each province for fighting the pest, and the central points where such material may be stored so as to be readily available in case of an outbreak. It is to be hoped that reports for 1911 will continue the accuracy and completeness which marked those for 1910.

During the past year locusts have appeared in the vicinity of eighty-four towns and barrios of the Archipelago, and in the majority of cases they were destroyed. Reports show the

area of greatest infestation to be a broad belt extending from Romblon to Bohol and including Romblon, Antique, Iloilo, Capiz, Occidental Negros, Oriental Negros, southern Cebu, and Bohol, and the flying swarms to be moving in a northeasterly direction traveling with the southwest monsoon.

The Locust Act, by which the destruction of locusts is made compulsory, has been in many cases severely criticized. It may be of interest to those who criticize it to know that of all the countries which are periodically visited by locust swarms and other noxious insects, there are few of any importance where legislation has not been enacted. Even the Barbary States have enacted measures to regulate this pest. The following list of countries in which locust extermination is regulated by law will convey a better idea of the importance of this matter in the eyes of the leading governments of the world: Dutch East Indies, Australia, Cape Colony, Transvaal, Orange Free State, Portuguese East Africa, Algeria, Morocco, Egypt, Turkey, Austria-Hungary, Argentina, Brazil, Mexico, and the United States.

Provinces and towns reporting locusts in 1910.

Provinces and towns.	Date.	Kind.
ALBAY.		
Oas	February 6	Fliers.
Manito	September 7	Locusts.
Polangui	December 16	Do.
Libon	do	Do.
Legaspi	December 12	Fliers.
AMBOS CAMARINES.		
Nueva Caceres	August	Young hoppers.
Nabua	October 18	Fliers.
ANTIQUE.		
Bugasong	June 28	Fliers and hoppers.
Culasi	do	Do.
Dao	do	Do.
Laua-an	do	Do.
Pandan	do	Do.
Patnongon	do	Do.
San José	do	Do.
San Remigio	do	Do.
Sibalom	do	Do.
Tibiao	do	Do.
Valderrama	do	Do.
BATANGAS.		
Alitagtag	October	Fliers.
Bauan and barrios	do	Do.
Cuenca	do	Do.
San José	do	Do.
Taal	do	Do.
Lipa	do	Do.
BOHOL.		
Bilar	September to December	Do.
Sierra-Bullones	do	Hoppers.

Provinces and towns reporting locusts in 1910—Continued.

Provinces and towns.	Date.	Kind.
CAPIZ.		
Dao and barrios	June	Fliers.
Looc (Romblon)	do	Hoppers.
Nabas and barrio	do	Fliers.
Odlongan (Romblon)	do	Hoppers.
Panitan and barrio	do	Fliers.
Pilar and barrio	do	Do.
Pontevedra and barrio	do	Do.
Sigma and barrio	do	Do.
Tapas and barrio	do	Do.
CEBU.		
Bantayan	May 5	Do.
ILOILO.		
Cabatuan	March	Hoppers and fliers.
Dingle	do	Do.
Guimbal	do	Do.
Janiuay	do	Do.
LA LAGUNA.		
Cavinti	August	Fliers.
Lilio	do	Do.
Luisiana	do	Do.
Magdalena	do	Do.
Majayjay	do	Do.
Nagcarlan	do	Do.
LEYTE.		
Palo	September	Locusts.
Tacloban	do	Do.
MINDORO.		
Palauan	July 20	Do.
San José	do	Do.
MORO.		
Biuang Coast	May	Do.
Do	November	Fliers.
OCCIDENTAL NEGROS.		
Bacolod	June	Hoppers.
Valladolid	do	Do.
La Carlota	do	Do.
Silay	do	Do.
Manapla	do	Do.
ORIENTAL NEGROS.		
Bacon and barrio	January to July	Fliers and hoppers.
Dauin and barrio	January to February	Fliers.
Do	March to July	Hoppers.
Dumaguete and barrio	January to February	Fliers.
Do	March to July	Hoppers.
Luzuriaga and barrio	January to February	Fliers.
Do	March to July	Hoppers.
Manjuyod and barrio	January to February	Do.
Siaton and barrio	March to July	Do.
Tanjay and barrio	do	Do.
Tayasan and barrio	do	Do.
Zamboanguita and barrio	do	Do.
SAMAR.		
Almagro	May to October	Fliers.
Calbiga	do	Do.
Gandara	do	Do.
Santa Rita	do	Do.
Villareal	do	Do.
SORSOGÓN.		
Masbate	June 25	Hoppers and fliers.
Milagros	June 28	Hoppers.
Do	June 25	Fliers.

Provinces and towns reporting locusts in 1910—Continued.

Provinces and towns.	Date.	Kind.
TARLAC.		
Paniqui -----	June -----	Hoppers.
TAYABAS.		
Alabat -----	August 23 to September 21..	Fliers.
Antimonan -----	September 3 to 9 -----	Do.
Calauag -----	August 8 -----	Do.
Candelaria -----	September 3 to 20 -----	Do.
Dolores -----	September 1 to 7 -----	Do.
Guinayangan -----	August 6, 21, and 23 -----	Do.
Lucena -----	September 14 -----	Do.
Lucban -----	August 23 -----	Do.
Mauban -----	August 17 to 20 -----	Do.
Polillo -----	September 1, 5, and 18 -----	Do.
Sariaya -----	September 6 and 16 -----	Do.
Tayabas -----	August 20 to 23 and 29 -----	Do.

The following provinces have not reported any damage done by locusts: Agusan, Bataan, Bulacan, Cagayan, Ilocos Norte, Isabela, La Union, Batanes, Misamis, Mountain, Nueva Vizcaya, Palawan, Pangasinan, Rizal, Surigao, and Ilocos Sur.

No reports have as yet been received from the following provinces: Cavite, Nueva Ecija, Pampanga, and Zambales.

SCHOOL FARMING IN BUKIDNON.

By LEWIS S. THOMAS.

From the time of the establishment of the first schools in the subprovince of Bukidnon, agriculture has been recognized as the form of industrial work most to be emphasized in the course of instruction. The existing conditions have been particularly favorable for this work. Land of good quality and in abundance has been available, and there has been, furthermore, a great need for an increase in the food supply. The schools have been able to take up enough public land to make practical farming possible, and the force of hunger has assisted materially in bringing about coöperation and expenditure of energy by the pupils. What was most needed was a broadening of their view, and the teaching of larger ideas in farming. The people were accustomed to plant their crops in clearings in the woods without any attempt at order or even cultivation. In the establishment of this work there has been, as was to be expected, a certain amount of inertia to be overcome.

The first attempts at school farming in Bukidnon were necessarily limited in extent. The pupils had first to gain that confidence in the value of their own endeavors without which no people can do work that will be of permanent value. After this came instruction in the way to plant, some use of fertilizers, a little instruction as to the value of the rotation of crops, and a great deal in the importance of order, discipline, and pertinacity. There was set aside for agricultural work a period of forty minutes of each day, preferably in the morning, since that time was cooler. To encourage the pupils the gardens were first cut up into small beds from which each pupil received the products of his own labor. From this grew the system of communal work in breaking the land. The gardens were laid out in rows of beds, with each pupil's land marked by rows of gabe. In this way the industrious pupils received the benefit of their labors, the fields had a more regular appearance, and practical

demonstration of work on a large scale was given, not only to pupils but also to whomsoever chanced to pass.

As a means of breaking the land, the adze hoe, called in the vernacular "bincong," was found to be the most useful implement. This work was given over to the larger boys, working in relays. The smaller boys followed with crooked sticks, breaking the clods and taking out the cogon roots by hand. At Tangculan, Maluco, Impasugong, Kalasungay, and Malabalay considerable land was plowed with a disk plow. In Dalirig, Impasugong, Bugcon, and Sumilao the people assisted with their own animals, sometimes doing the work without recompense, in others doing it for the privilege of using the plows and harrows which belonged to the schools. In all cases, however, the land had to be worked over behind the plows by hand. It was attempted to manage the work of breaking the land so that only enough was broken to be handled easily by the children. With this end in view newly broken land was planted to rice. After the harvest, this land was cleaned and re-worked, and planted to some crop that aided in the disheartening labor of keeping the weeds down. New land was then broken and the following year all was planted to rice. Thus the interest was kept alive, since the children were more interested in a rice supply than in anything else. In order to be able to handle the land well and to plant permanent crops, the farms were laid out in rows 2 meters in width, separated by paths 1 meter in width. Down the middle of these paths were planted the rows of permanent crops and the requisite shade. This plan made it possible to keep the permanent crops clean and left room enough to plant food crops. The permanent crops most in evidence are coffee and cacao. Coffee was planted at intervals of 3 meters. Shade was planted in the proportion of one shade plant in every four, so arranged that the rows of shade run diagonally across the land. Bananas were planted in between the hills of coffee and cacao. For the youngest plants it was found that the best shade was that produced by planting camoteng cahoy at each tree. The trees that grew under this shade flourished with a rich green color of leaf. The principal shade was gau-gau, a legume which is very plentiful in this section. This plant is easy to grow since the branches may be cut into small pieces which take root readily. All the coffee seeds were sprouted in the school seed beds.

Of the crops grown the principal one, of course, is rice. Attention has been paid at the same time, however, to teaching the cultivation of various other crops. A considerable plot is always reserved for camotes, planted at such periods that

the land may be cleared in time for the rice planting. The growing of cowpeas has been encouraged until they are now beginning to form a part of the diet of the people. At every harvest all of the cowpeas that are not required for seed are distributed among the boys for their personal use. Attempts have been made at growing peanuts, but the soil contains too large a proportion of clay for the best growth of this crop. After one season's cultivation, however, the soil becomes more loosened and the peanuts then do much better. Camoteng cahoy is planted in large plots, as camote, and is also used wherever there is coffee to be shaded. It supplies an article of diet much appreciated by the pupils. Some arrowroot was planted this past year and the plants are now beginning to show up. The use of this product will, however, need instruction. Bananas are planted at all times. Each tract of land contains approximately 4 hectares and has three rows of bananas around it. The variety called sabá is the one most used. This banana has a bud that can be used for "greens," the fruit can be cooked, and the fiber is of great value for weaving. Moreover, it grows rapidly and serves as a windbreak. Considerable ginger was planted on one farm, the ordinary wild variety being used; it was dug up out of the cogon and planted out so that it might have a chance to develop. A kind of small bean common to this section, called "balatong Moro," was planted as a temporary windbreak and for shade. This variety grows like a tree, will stand at least two seasons, and produces abundantly. For camotes the variety called, by the Bureau of Education, "Beattie camote" was the most popular. This camote is large, of excellent flavor, and has a strong vine.

So much for the native crops. In the crops of improved seeds and foreign vegetables about every kind was planted. Okra grows almost like a weed, but the people do not seem to appreciate it as an article of diet. One thing to be noted in all of the work was that the cultivation and care of a crop varied with its possibilities as a readily cooked and well-known article of food. Cabbages were planted, but the care necessary to their proper development was lacking, since there was so much that could be done with crops that were better known. Large tomatoes were planted in quantities at all of the schools. The degree of success with this crop varied according to the time of the year when planted. Large tomatoes must be planted so as to be ripening as the rains diminish, otherwise they rot on the vines. Lettuce has always been a popular crop on account

of the ease with which it is grown, but the people need a food that does not cost so much to garnish. Beans were one of the most satisfactory crops planted. All varieties but the Lima flourished and much seed was secured. Kalasungay raised some excellent peppers of the large kind and the garden won fame because of the appearance of this crop. Pechay did well and took the fancy of the pupils. Beets were not as successful as might have been expected. Radishes, especially the white Chinese varieties, grew prolifically and gave large quantities of seed. Carrots grow well and have a fine flavor, but do not produce seed. Squashes of the native kinds have been planted around in the corners and wherever there happened to be room. American sweet corn was planted but did not flourish. Every garden produced good crops of the native flint corn which seems to be the best adapted to the peculiar means of preparation for food in this locality. Mexican June corn was secured from the Bureau of Education and planted at Tanguilan in March. The sweet ears proved to be too much of a temptation to the dogs of the town which robbed the garden continually in spite of all precautions. Some ears were, however, saved.

Guinea grass proved to be a crop well worth growing. It formed the principal source of revenue for as many schools as were able to get a stand started. Nearly every school now has enough guinea grass to supply any travelers and to feed such stock as may be engaged in doing work on the school farm. At Malaybalay a package of seed was planted in the middle of the dry season and from this came enough to make a stand of over one thousand hills for that school and enough to start those of every other school except Tanguilan.

Pineapples from a selected variety furnished in 1908 by the Bureau of Agriculture have furnished seed for every other school in the district. No opportunity has been had to test the fruit on account of the hunger which drives the people to appropriate them before they have ripened. Wherever it appeared that pineapples were peculiarly adapted, this fruit has been planted in hundreds and with some attention to regularity and ease in harvesting.

Maguey at the Malaybalay School, also furnished by the Bureau of Agriculture, is almost ready to cut and has supplied many plants for the other schools. At the beginning the maguey plants did not grow well, but the burying of bones around each plant seemed to give them what was required.

Sugar cane was planted in quantity this year for the first time in the expectation of beginning some instructions in making

sugar. Up until now the principal, and in fact practically the only, use for sugar in this subprovince has been for making a sort of cider or tuba from the juice and the distilling of a peculiarly fiendish kind of spirits.

Consistent attempts have been made to cultivate American cotton. Of course one difficulty with the successful production of cotton as a commercial crop is the lack of gins. The rains, which have been almost continuous since 1908, have tended to rot the bolls long before they were ripe. The native variety of cotton, known as "gapas Moro," has been planted, but the harvesting has not been conducted as regularly as it should have been to give results. Enough cotton has been gathered at various times to make it possible to begin spinning, but each time some branch of the Government has called for collections of agricultural products and the cotton has been sent. It has been suggested that some of the buds of the American variety be grafted upon the stalk of the native variety, but other more important matters have demanded more immediate attention.

There have from time to time been opportunities to secure seeds from oranges grown by the Jesuit Fathers at Sumilao. These have invariably been saved and given to the teachers to plant, with the result that there are now a few trees of this variety growing. The lieutenant-governor presented the schools with a number of Batangas orange trees of a year's growth which are also growing in several schools. The Jesuit Fathers have also a variety of lemon which makes a good close tree. These have been planted with the intention of making hedges. The school at Malaybalay has one hedge of this kind.

Benguet pine seed was secured from the Director of Forestry. These trees grew well but did not endure transplanting. The only ones left are in Kalasungay where some three hundred were once counted. These are, however, dying in spite of every effort.

A quantity of other shade and ornamental trees were also secured from the Bureau of Forestry. All but the fan palm grew and were used in Arbor Day celebrations in decorating the plazas of the towns. In Kalasungay there are still some excellent saplings in the nursery. The *Lebbeck albizzia* did not grow as well as was expected. The fire trees did well and all that were planted are flourishing.

Rubber of the Ceara variety was planted during the long vacation to the number of over 1900. Some 200 were transplanted from the beds to the plazas. While this may not be the best variety of rubber, it makes an excellent shade tree and is ornamental. It also grows rapidly. Some Pará rubber seed was

sent to the district. As usual, transportation facilities delayed the receipt of the seed until it was certain that some were spoiled. All were planted, however, in Alanib, where the number of gutta-percha trees promised the best results in rubber planting.

Kapok has been planted continually. During the last long vacation there were planted some twenty packages of seed both in seed beds and along the fences. Many of the older trees are now being cut into posts for a barbed wire fence at Maluco. There has always been enough kapok for Arbor Day plantings.

Lanzone trees were planted at Sumilao and the nursery has been used as a means of giving presents for regular attendance. Mangos have been planted whenever anyone was so fortunate as to get a ripe fruit.

"Tangan-tangan," or castor bean, can be seen in quantities in almost every garden. It was planted first for its value as shade but later to furnish food for the larvæ of the species of silkworm which feeds upon the leaves of this plant. The larvæ, however, have not as yet been received.

Large papayas have been plentiful in the school at Tangcunan. From this school the seed has been scattered pretty well over all the districts until every town now has some young trees of the large variety growing. Crows, high winds, and the taste of the people for green fruit are things to be combated in the cultivation of the papaya.

Besides these practical plants some experimental work has been done with tobacco. Sila-i, Imbasugong, Alanib, and Puntian have hills of tobacco that are being cultivated under the direction of the teachers, who, while not being experts in this work, have more knowledge of this crop than the natives of the district.

Flowers have not been omitted. No school is without its bed of flowers more or less well and artistically arranged to lighten the monotony of the cogon. Around the flag poles are banked the red and gold on the dark green of the Spanish flag, while walks, paths, and grounds are edged with the flaming colors of many a variegated leaf. Some American flower seeds of perennial varieties have been planted and are growing well.

As results of the work done there may be mentioned as chief, the increase in the number of gardens among the townsfolk. The manner of doing the work has borne fruit in the better arrangement of plantings and economy of space visible to anyone who may pass through the towns where schools have been established. Many times pupils have been fed for days from

the products of the farm. When the baseball teams play in neighboring towns the hosts supply the camotes from the farms and the girls prepare the food for the visitors. In all of this movement the Filipino teachers assigned to work in the district have been the means of encouragement. In not a single case has a teacher shown laziness. Their work has been consistent and at the same time the academic branches have not suffered.

With the addition of four good bulls to the equipment there promises to be a more thorough system of cultivation, since the work will go on more rapidly and such experiments as burying the rice straw can be done with much less labor. Altogether the school farms of the district of Bukidnon may be taken as an answer to all critics of the Bureau of Education, for here is to be seen, perhaps in a most favorable light, the results of the plans of the Bureau, favorable because here are the conditions most suitable to practical agricultural work.

CORN-LEAF BLIGHT IN THE PHILIPPINES.

By C. B. ROBINSON, *Bureau of Science.*

On July 5, 1910, there were sent to the Bureau of Agriculture, three leaves of maize, *Zea mays* Linn., attacked by some disease. They came from Sagada, in the Mountain Province, and were transmitted by Señor Jaime Masferré, who supplied various particulars regarding the appearance of the disease.

On April 13, two sowings were made of the imported variety of maize known as "Mexican June," in two lots of ground, neither good, one fertilized with cow manure, the other not fertilized. The growth was slightly greater in the fertilized plot, but much more rapid. The disease was more conspicuous in the fertilized plot, but varied within it, although present to a greater or less extent everywhere. Where the plants were crowded, the intensity of the disease was greatest; where they were less densely crowded, and exposed to open sunlight, it was least.

The specimens were forwarded to the Bureau of Science for identification, but as the disease had not previously been met with in the Philippines, they were submitted by Mr. E. D. Merrill to the Bureau of Plant Industry, Washington, District of Columbia. The report upon them, by Mr. G. H. Powell, is as follows:

The leaves are badly blighted by a fungus, *Helminthosporium inconspicuum*. A similar, if not identical, fungus has been described from Europe as *Helminthosporium turcicum*.

Infection takes place through the stomata. Usually the disease does not appear till the corn is well advanced, though seedlings may be attacked. The trouble is characterized by a wilting of the leaves due to the growth of the fungus in the tissues. Elongated dead spots are formed, sometimes comprising almost the entire blade. On these the sporophores and spores appear, forming a dark hairy growth visible to the naked eye.

Rotation of crops is recommended as a preventative; also the manure made from diseased corn should not be used on land intended for corn.

Additional notes, furnished by Señor Masferré, showed that in the first sowing, which was dense and well fertilized, the disease appeared when the plants were still young, but had already attained a height of 1.5 meters. Believing that the disease was favored by deprivation of light through too close planting, or by the manure, the plants of the second sowing were placed farther apart, and no manure was used. In this second case, the disease was slower in appearing, but at the same stage in the growth of the plants, namely, when they were about 1.5 meters high; but, once it did appear, was of greater intensity than in the preceding case.

A third sowing was made in poorer soil, and at very short intervals. The disease appeared when the plants were about 60 centimeters high, their growth was in general poor, and no crop was obtained from them.

From the second sowing but a small crop was obtained, but in the first, the plants, although attacked as already stated, continued to grow, and yielded a good crop of large ears, some of which attained a length of 25 centimeters. It was calculated that the disease reduced the crop by one-half. The common maize of the region was also attacked, but to a less extent.

Hitherto *Helminthosporium inconspicuum* C. & Ell. has not been reported except from the United States. In that country, it was noted as destructive as far back as 1889. From 1903 to 1907 it is frequently mentioned in reports,¹ doing damage, often serious, in the States of Delaware, Maryland, Pennsylvania, New Jersey, Connecticut, Ohio, West Virginia, Georgia, and Vermont. However, mycologists seem agreed that it is at least almost identical, both in its appearance and in the nature of the disease produced by it, with *H. turcicum* Pass., of southern Europe. Clinton² definitely reduced it to the latter.

It would naturally be suspected that a species of fungus, hitherto unknown in the Philippines, appearing for the first time on an introduced variety of corn, must have been imported at the same time as its host. In the present case, there are two objections to this view. First, the "Mexican June" was grown at the Singalong experiment station, Manila, for two

¹ See Yearbook U. S. Dept. Agric. 1903, 554; 1904, 585; 1905, 608; 1906, 505; 1907, 585; Bull. Del. Coll. Agric. Exp. Sta., 63 (1904) 19-25, pl. 1, 2; Ann. Rep. Vermont Agric. Exp. Sta., 17 (1905) 385.

² Rep. Conn. Agric. Exp. Sta. 28 (1905) 317.

years, and no disease was noted upon it. The seeds sown at Sagada were from these Singalong plants.

Again, *Helminthosporium turcicum* has recently been reported from Japan.¹ It is therefore quite possible that the species may have been introduced through natural causes. Very great care will have to be taken to prevent its spread in the Philippines, as the results might be very serious.

¹ Bot. Mag. Tokyo, 19 (1905) 199-222; Just Bot. Jahresb., 33¹ (1907) 119.

GARDENING ON THE ISLAND OF GUIMARAS.

By F. G. LAWTON, *Captain, Nineteenth Infantry.*

LAND.

The land selected was a piece of about one-fourth of an acre, slightly sloping so as to afford good drainage. It was new land, the soil being sandy and inclined to run together after being wet. It was plowed deeply several times and well-rotted manure most liberally applied. Great care was taken in the original preparation as well as in the after care of the ground and I am sure that any failures that occurred could in no way be attributed to any shortcomings in this respect.

PLANTING.

Planting was done in the open ground and in germinating beds toward the latter part of the rainy season, and continued from time to time while there was any chance of obtaining proper climatic conditions. The following sets forth in detail the results obtained:

Beans.—Bush were first tried. Seed sprouted nicely, plants grew well and appeared thrifty up to the point of setting beans. When the beans were about an inch in length they dropped from the vines and the latter died out from rust. D. M. Ferry & Co.'s Golden Wax freshly imported were used.

Pole were tried with better results, however the vines were not very prolific nor did they continue to bear very long. D. M. Ferry & Co.'s Golden Cluster Wax were planted.

Lima beans grew to perfection, but I found that the best imported seed could not compare with the bulk dried beans bought in Iloilo.

Beet and carrot.—Seed sprouted well, plants grew nicely but apparently went to top. My experience convinced me that these vegetables can not be grown profitably on this island.

Cabbage.—Henderson's Early Summer from Ferry gave excellent results. Seed was sown in boxes and transplanted.

Trouble was experienced with worms eating out the buds and no way was found to keep them off.

No doubt cabbage can be profitably grown, and I intend to try it again in my next planting.

Corn.—Excellent results were obtained from the White Mexican June corn sent me by your Bureau. I have ordered Black Mexican and Mammoth from Ferry and will report result of their planting.

Cucumber.—Excellent results were obtained from Ferry's Evergreen White Spine. However, trouble was experienced with bugs on the young plants which was overcome by use of Paris green. The vines were not very prolific and did not continue to bear as long as might be expected. Effort was made to save seed and replant. The result was not encouraging and I do not believe the seed can be used from one crop to another.

Eggplant.—Ferry's Improved Large Purple was planted. It gave beautiful vines and some very handsome fruit. However, the vines would wither and die overnight as if something had bored into the root. Careful examination was made of a number of plants, but I was unable to determine the cause. The young plants, too, were troubled by lice. These were killed with tobacco water. I believe that this vegetable can be grown successfully. I grew excellent ones in profusion from this seed at Malabang, Mindanao.

Lettuce.—Best result obtained with Ferry's Early Prize Head. This grew to perfection, but would not be valuable for market as it is too tender to stand handling. The next best was Ferry's Salamander (black seeded). I find that lettuce seed retains its germinating power for a very short time in this climate.

Muskmelon.—A total failure.

Watermelon.—Georgia Rattlesnake from Ferry grew to perfection. My melons averaged 30 pounds in weight and some went as high as 40 pounds. Shape, color, and taste perfect. I have been told that seed saved from melons here will not reproduce satisfactorily. This I will try out and report on later.

Okra.—White Velvet grows to perfection practically the whole year around.

Onion.—Absolute failure in attempt to grow from seed.

Parsley.—Grows to perfection if started in boxes. Seed must be soaked in luke-warm water for twenty-four hours before planting.

Peas.—Absolute failure.

Pepper.—Both sweet and small chili grew to perfection. Plants started in boxes and transplanted. Attempt to reproduce from seed raised here was a failure. Pepper seed does not keep for any length of time in this climate.

Radishes.—Grown to perfection almost continuously. However, care was necessary to keep earth pulled up around growing plants, otherwise they shot up and made no roots. Peculiarity noticed was that radishes grew old, large, and strong but never lost their crispness.

The French Breakfast was found to be the best, as giving the best root and the smallest top.

Tomato.—Grown to perfection from Ferry's Early Detroit. An effort was made to trim and train vines on poles. They were given ample room and watched carefully, but gave poor success. Another set was raised slightly from the ground on bamboo frames and allowed to grow at will. These vines produced perfect fruit. Vines not as prolific as in the United States and all fruit ripened in about two weeks. Bugs and worms gave considerable trouble. These were picked off by hand and killed with Paris green.

Turnip.—Seed sprouted well and plants started off nicely but they went all to top. They can not be profitably raised here.

STATISTICS REGARDING CORN AND COCONUTS GROW- ING IN THE PHILIPPINE ISLANDS.

By W. D. HOBART, *Statistician.*

STATISTICS ON CORN IN THE PHILIPPINE ISLANDS, FISCAL YEAR 1910.

Province.	Amount of corn produced.		Area cultivated in hectares.	Liters produced per hectare.
	Cavans.	Hectoliters.		
Agusan.....	16,156	12,117	1,044	1,160
Albay.....	26,882	20,124	3,480	570
Ambos Camarines.....	59,608	44,706	6,992	639
Antique.....	33,793	25,345	4,014	631
Bataan.....	18,406	13,805	2,567	538
Batangas.....	124,523	93,392	13,056	715
Bohol.....	350,814	263,110	34,005	774
Bulacan.....	65,457	49,093	5,181	948
Cagayan.....	304,788	228,591	21,997	1,039
Capiz.....	58,403	43,802	5,356	818
Cavite.....	22,408	16,806	2,119	793
Cebu.....	2,319,673	1,739,755	179,414	968
Ilocos Norte.....	202,963	152,222	14,457	1,053
Ilocos Sur.....	267,824	200,882	27,081	743
Iloilo.....	144,354	108,266	14,144	765
Isabela.....	164,519	123,389	14,728	837
La Laguna.....	45,424	34,068	5,692	598
La Union.....	28,905	21,679	5,228	414
Leyte.....	362,850	272,158	24,118	1,128
Mindoro.....	7,004	5,253	4,462	1,137
Misamis.....	41,088	30,816	3,484	884
Moro.....	40,467	30,350	3,044	997
Mountain.....	21,773	16,330	4,412	370
Nueva Ecija.....	55,305	41,479	6,092	380
Nueva Vizcaya.....	2,622	1,967	161	1,221
Occidental Negros.....	618,393	463,795	42,771	1,084
Oriental Negros.....	303,335	227,501	26,212	867
Palawan.....	4,987	3,740	433	863
Pampanga.....	57,577	43,183	6,783	641
Pangasinan.....	486,143	363,857	52,161	697
Rizal.....	23,595	17,696	2,492	710
Samar.....	211,672	158,754	18,129	875
Sorsogon.....	119,327	89,495	16,861	530
Surigao.....	45,606	34,205	2,808	1,218
Tarlac.....	17,803	13,352	3,000	445
Tayabas.....	27,007	20,255	5,212	388
Zambales.....	7,727	5,795	678	854
Total.....	6,709,131	5,031,133	579,768	868

The production of corn in the Philippines is increasing, in some provinces, notably Cebu, it being the principal food of the people. Where not grown as an alternate crop two and sometimes three crops a year are harvested. The low production in some provinces is explained because it is planted in the same fields with other crops, and in others because a large proportion is cut for forage, the reports of which so far not having been sufficiently complete to base statistics on.

PRODUCTION OF CORN **COSECHA DE MAIZ**

BY PROVINCES **POR PROVINCIAS**

FISCAL YEAR 1910
AÑO ECONOMICO 1910

Legend

Signos

Quantities in Hectoliters
Cantidades en Hectolitros

Less than 15,000

Menos de

15,000 To 40,000

40,000 To 100,000

100,000 To 250,000

250,000 To 500,000

Cebu 1,739,755

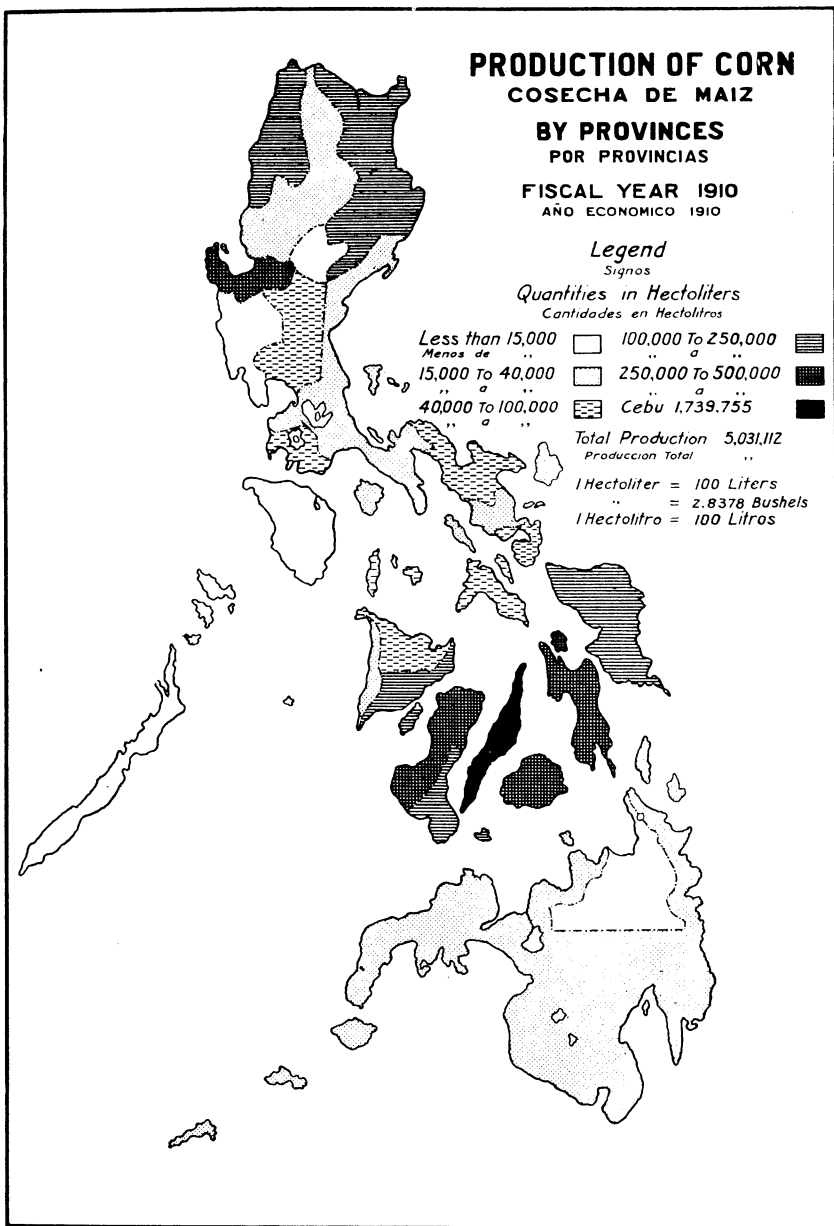
Total Production 5,031,112

Produccion Total

1 Hectoliter = 100 Liters

" = 2.8378 Bushels

1 Hectolitro = 100 Litros



THE PHILIPPINE ISLANDS.

**ENTIRE NUMBER OF COCONUT TREES JUNE 30, 1910, AND THEIR
PRODUCT FOR THE FISCAL YEAR 1910.**

Province.	Trees.	Nuts gathered.	Nuts consumed for food.	Copra.	Oil.	Tuba.
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Kilos.</i>	<i>Liters.</i>	<i>Liters.</i>
Agusan	32,880	631,296	220,954	82,068		51,840
Albay	1,819,047	41,219,640	20,197,624	927,442	1,573,841	40,000
Ambos Camarines	1,491,562	28,876,628	10,395,586	4,259,302	120,319	634,500
Antique	168,086	3,776,892	2,303,304	260,186	18,884	945,270
Bataan	12,483	174,748				
Batangas	118,574	1,973,056	1,341,678	141,417		
Bohol	1,680,171	49,195,344	9,839,069	7,084,129	342,228	15,594,120
Bulacan	1,995	53,616	53,616			
Cagayan	48,459	992,392	994,392			
Capiz	2,230,390	49,068,580	25,024,976	5,888,229	49,068	13,047,750
Cavite	46,280	777,510	645,333	33,294		
Cebu	2,367,307	88,063,800	21,135,312	13,870,048	954,025	42,611,400
Ilocos Norte	52,614	757,620	583,367		21,782	
Ilocos Sur	82,072	827,280	810,734		1,838	
Iloilo	774,422	13,010,280	8,196,476	1,073,348	43,368	32,200,200
Isabela	527	18,460	18,460			
La Laguna	3,537,920	140,384,640	49,134,622	14,974,362	2,169,580	1,134,000
La Union	122,136	1,954,160	1,367,912	68,370	15,194	
Leyte	1,441,864	60,212,232	17,461,547	10,238,079	138,951	29,197,800
Mindoro	125,304	1,714,140	1,217,039	58,281	17,141	302,770
Misamis	367,694	11,295,424	2,372,039	1,807,270	71,880	585,350
Moro	2,953,012	87,527,232	27,133,441	14,223,175	350,108	237,000
Mountain	7,009	112,128	112,128			
Nueva Ecija	7,564	91,044	91,044			
Nueva Vizcaya	2,718	46,080	41,472		307	
Occidental Negros	616,693	12,432,528	4,848,686	1,367,578	67,814	2,940,010
Oriental Negros	581,659	14,215,708	3,543,927	2,135,925	12,923	27,144
Palawan	129,393	2,442,944	1,270,331	293,153		139,860
Pampanga ^a	2,586					
Pangasinan	1,001,517	37,016,056	25,170,918	2,313,503	235,566	
Rizal ^a	431					
Samar	3,499,029	75,439,055	35,456,356	3,269,026	62,866	23,618,250
Sorsogon	1,481,255	38,453,360	13,458,676	6,056,404	69,915	7,498,440
Surigao	408,869	11,268,400	3,042,468	1,727,821	30,049	1,177,470
Tarlac	14,973	215,610	209,142		647	
Tayabas	5,551,902	162,559,680	22,758,355	32,918,330	625,229	2,490,310
Zambales	58,147	1,130,364	983,416	70,082		
Total	32,838,544	937,927,927	311,609,148	125,140,822	6,993,513	174,483,484

^a Trees not in bearing.

A great many coconut trees have been planted the last few years because of the advancing price of and seemingly assured market for copra and the lower prices prevailing for hemp. So far correspondents have reported the total number of trees only, without separating those in bearing and those which have not yet come into bearing. It is roughly estimated that about 22,000,000 coconut trees are now in bearing. Correspondents have in large part failed to fully understand the data desired as to coconut productions, so the above figures are an estimate based on insufficient information. Formerly trees were planted much nearer together than at present, it having been demonstrated that trees planted at intervals of 7½ meters or even more give much better results than those planted closer together. It is because of the wide differences in the density of growth and irregularity of the surfaces they occupy that coconut trees are reported by number instead of the hectares they cover.

COCONUT TREES COCOTEROS

BY PROVINCES POR PROVINCIAS

END OF FISCAL YEAR 1910
TERMINO DEL AÑO ECONOMICO 1910

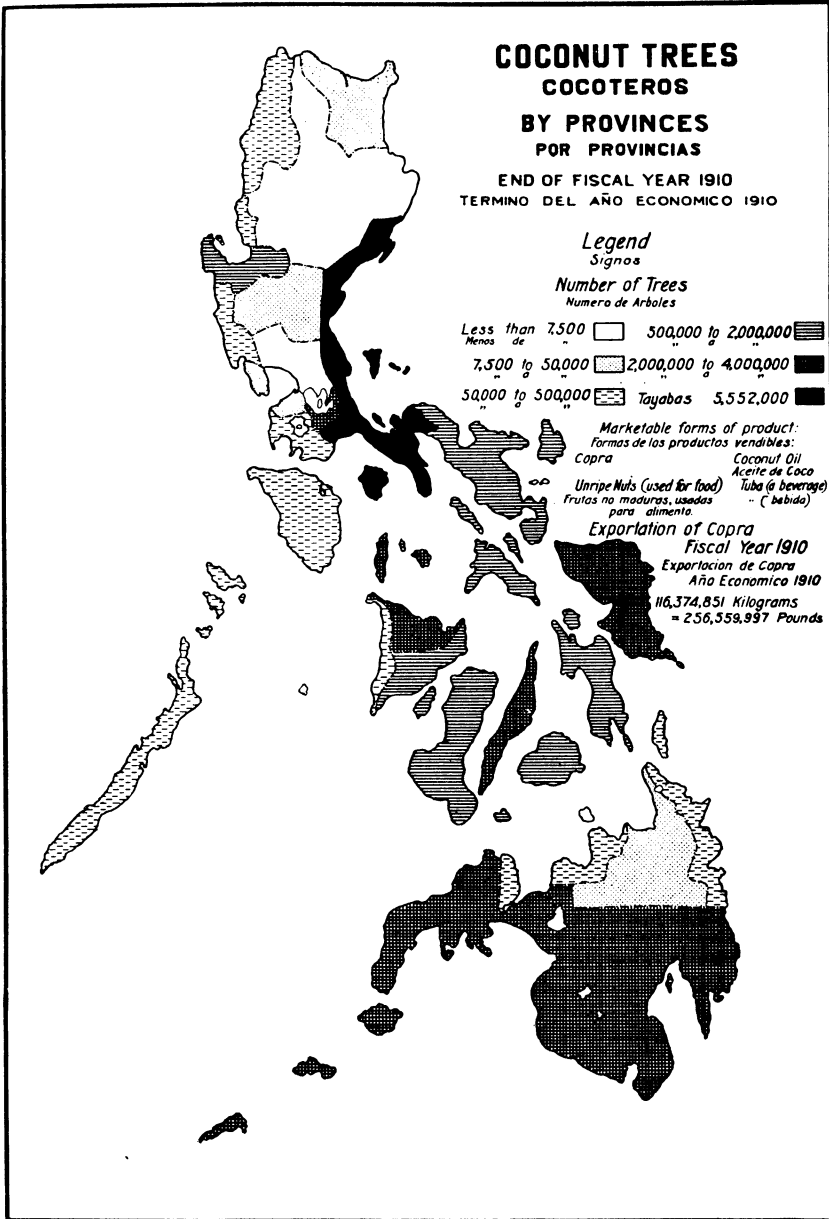
Legend Signos

Number of Trees Numero de Arboles

Less than 7,500 Menos de 7,500	500,000 to 2,000,000
7,500 to 50,000	2,000,000 to 4,000,000
50,000 to 500,000	Tayabas 5,552,000

Marketable forms of product:
Formas de los productos vendibles:
Copra Coconut Oil
Unripe Nuts (used for food) Tuba (a beverage)
Frutas no maduras, usadas para alimento .. ("bebida")

Exportation of Copra
Fiscal Year 1910
Exportacion de Copra
Año Economico 1910
116,374,851 Kilograms
= 256,359,997 Pounds



THE PHILIPPINE ISLANDS.

INDIAN CATTLE IN THE UNITED STATES.¹

A. P. BORDEN, *Pierce, Texas.*

The zebu or humped cattle of India form a distinct species and are scientifically classed as *Bos indicus*. Darwin in his work on animals and plants under domestication says that the zebu was domesticated as may be seen on the Egyptian monuments at least as early as the Twelfth Dynasty; that is, B. C. 2100. Some time in the early fifties a few animals of this breed, familiarly known as Brahma cattle, were brought into this country, and their offspring then distributed all along the Gulf coast. Observing stockmen soon learned that they stood the climatic conditions and insect pests better than any other breed. From time to time there has been a bull or two obtained from shows and added to the breeding herds of the Gulf coast country.

In 1904 Hon. James Wilson, Secretary of Agriculture, made a visit to Texas and after seeing the condition of the Brahma grade cattle as they then existed on the ranch of A. H. Pierce and comparing them with the beef breeds found on the same ranch had a special permit issued to A. P. Borden, executor of the estate of A. H. Pierce, for the importation of some pure bred animals direct from India. The story of the permit for importation, my trip to India, the purchase of the fifty-one head of animals, their arrival in New York, their quarantine on Simonson's Island, and their final release would make an interesting tale. The points of practical interest are that the cattle were bought with difficulty in India and could not there be tested. When put in quarantine on an island outside the harbor of New York, it was necessary to be at the expense of a long quarantine period to be sure that all brought to the mainland were free of the dread disease *surra*, which is even a more serious disease in horses than in cattle.

¹ From the American Breeders' Magazine, Vol. I, No. 2, 1910.

This importation landed in New York in June, 1906, and in south Texas in November of the same year. It consisted mostly of young bulls. Upon arrival in Texas the cattle were first tested for Texas fever by Doctor Francis of our State Agricultural and Mechanical College. After carefully watching them for ten days he pronounced them to be free from Texas fever. This opinion proved correct, for in the three years since they were imported there have been no signs of this fever. The herd was divided as equally as possible between Mr. O'Connor and the Pierce estate, who jointly had shared the expenses of the importation. I have not seen Mr. O'Connor's cattle, but he tells me they have more than met all his expectations. The object of the importation was to find a race of animals which would resist the insect pests of this section of the country, the principal one of which is the tick which causes Texas fever. These bulls were bred to the best cows on the Pierce range and to a bunch of Hereford cows in 1907 and again in 1908. The crop of calves in 1908 were fine and did remarkably well. We are in the business of raising cattle on the open range where they must care for themselves most of the year. Crosses of these native and grade cattle with the best European beef breed grades do well in the feed lot, yet for the range we find them delicate and susceptible to the ravages of the tick. To make a fair test of the Brahma cattle I turned the bulls on the range with the best cows I could procure in this section of the country, mostly high-grade Herefords. These cows were covered with ticks all the year and as we had no dipping vats we had no way to remove them. We would occasionally find small ticks on the bulls, but were never able to find a fully developed tick on them. The first crop of calves at this writing, November 17, 1909, is from fourteen to twenty months old. They have been in tick-infested pastures with ticky cattle all their lives, but they fail to carry any ticks to maturity as far as I can see. It is only occasionally that we ever see a tick on one of these animals. This first crop of calves, about 300 in number, has grown upon the range as all our cattle and they are fully 50 per cent heavier than our ordinary range calves. They are as heavy as the calves a year older out of the same mothers, but sired by pure-bred Hereford bulls. The cross-bred animals are smooth, with very strong constitution, are good rustlers, of rapid growth, and are animals that have courage enough to look you in the face when you go about them. The results are better than I expected. It may be claimed for these cattle that they have the power of

immunity from Texas fever. They stand a tropical and sub-tropical climate better than the other breeds of cattle. They have the power of transmitting the tick-resistant quality through several generations. An animal with only an eighth or a sixteenth of the Brahma blood in his veins shows ability to thrive in this climate. Several Indian breeds are represented in this importation. Some of these are shown in the illustrations herewith. I wish to state that I am under many obligations to Secretary Wilson and other officers of the Department of Agriculture and also the chairman of the committee on the introduction of plants and animals of the American Breeders Association, Mr. David C. Fairchild, whose letters of introduction and assistance were of service to me.

ANIMAL DISEASES IN FORMOSA.

By FRANCIS W. O'CONNOR,
American Vice-Consul, Tamsui, Formosa.

Rinderpest has been prevalent since the Japanese occupation of the island; but the various urgent calls on the administrative body, till lately, left no time for the serious consideration of animal diseases.

At times when rinderpest was unusually prevalent the Formosan government promulgated regulations for the prevention of animal diseases, inaugurated organizations, and nominated authorities for this purpose. Owing to the efforts of the veterinary surgeons and the police supervision, this hitherto widespread disease has diminished considerably.

At present the disease is found only in limited sections of the island, in Kagi and Tainan, and little fear is entertained as to its spread in the future.

The statistics for the last five years are as follows:

Year.	Deaths.	Killed.	Re-covered.	Totals.
1906	2,530	1,878	717	5,125
1907	534	1,273	57	1,864
1908	903	4,729	1	5,633
1909	376	915	-----	1,291
1910 (January to August)	206	397	-----	603

MILZBRAND (ANTHRAX).

This disease first appeared in Formosa in June, 1907, and only the following cases have been discovered between that date and the present time:

1907	15
1908	7
1909	3
1910 (January to August)	5

SCHWEINESEUCHE-SCHWEINEPEST (SWINE PLAGUE).

This disease, like rinderpest, has long been prevalent in many parts of the island. The following figures show a gradual decrease during the last five years:

Year.	Deaths.	Killed.	Re-covered.	Totals.
1906.....	1,774	1,751	245	3,770
1907.....	1,716	947	97	2,760
1908.....	557	1,324	41	1,922
1909.....	433	560	70	1,063
1910 (January to August).....	769	723	-----	1,492

BOVINE TUBERCULOSIS.

Until comparatively recently this disease has not been found among oxen or water buffaloes on the island. In 1908 a few cases were found among cattle imported from Japan and Australia, and subsequently it was discovered that water buffaloes and native oxen were affected by the disease.

In 1910 the disease became so prevalent among the native cattle that orders were given for the destruction of those affected, regardless of the condition and severity of the disease; the Government of course making compensation for the loss to the owners. The numbers of animals killed were as follows:

1908	4
1909	13
1910 (January to August).....	161

RAUSCHBRAND (BLACKLEG).

The first case of this disease was discovered in the island in 1909, and since then the following number of cases have been reported:

1909	3
1910 (January to August).....	1

WUTHKRANKHEIT (HYDROPHOBIA).

Only two cases of this disease appeared in 1909. No other diseases have been found among animals in the island which are prejudicial to agriculture and public sanitation.

REGULATIONS RELATIVE TO LAWS OF THE NETHERLANDS INDIA GOVERNING IMPORTATION OF CATTLE.¹

The importation of cattle from Asia and Africa into Java and Madura is forbidden since the year 1897.. This also applies to the districts of Bali and Lombok.

In other districts of the colony the importation of cattle may be forbidden by the official chief of the district whenever considered advisable. When such importation is permitted from countries not mentioned in the prohibited list, and if considered necessary, such cattle are put in quarantine for a period of from twelve to twenty-eight days.

Cattle from Europe and America can be landed only in places indicated by the official chiefs of the different districts and only where there is a regular established Government veterinary surgeon, who must examine such cattle before they are allowed to be landed.

If any cattle plague, or other sickness, is discovered among the cattle examined, none of the cattle will be allowed landed and the ship having such cattle on board must leave the port at once, and will not be allowed to enter again until such animals are destroyed (thrown overboard) and the ship is thoroughly disinfected.

Should only part of the cattle be suspected of having cattle sickness and the other part be sound, then the sound cattle are allowed to be landed and put in quarantine for at least twelve days when, should no sickness appear among such cattle, they are set free.

It is required that the cattle suspected of cattle plague, or other sickness, be killed and thrown overboard. Cost of stabling, and other costs, during time of quarantine is for account of the importers of such cattle. There is no charge for Government inspection.

When the entire cargo of cattle are found sound such may be landed without quarantine by special permission of the director of agriculture of the colony.

Cattle from Australian ports may only be landed at Tand-

¹ Furnished by the American consul, Batavia, Java.

joeng Priok (Batavia Harbor), Samarang, and Soerabaya. (For the past three months it is prohibited to import cattle from Victoria and New South Wales.)

Before the cattle are landed the usual examination takes place, declaration from port of shipment declaring cattle sound must be produced, also declaration stating district from which cattle have come is free of any cattle sickness. Should animals be found free from any sickness and the necessary declarations be found in order, they will be landed. Whether such cattle have to be quarantined depends entirely on the director of agriculture.

Horses may be imported into any port of the Netherlands India under the following rules: (a) If there is a qualified government veterinary surgeon at the place where animals are to be landed; (b) if the animals are found sound and have come from a place where there has been no disease among cattle and no sickness has attacked the animals during the voyage; and no quarantine is required if permission can be had from the director of agriculture.

At any time a place in the Netherlands India is found to have contagious cattle diseases, the following preventative measures are enforced by the chief government official of the district:

(a) Isolation of the sick or suspected cattle; (b) removal to a safe distance of all the sound cattle where no other cattle are allowed to be taken; (c) prohibiting the transfer of the sick or suspected cattle to another district or place; (d) killing of all sick or suspected cattle if found necessary; (e) disinfection, or destruction if found necessary, of stables or any article which has come in contact with the sick cattle; (f) disinfection of person, or persons, who have come in contact with the sick cattle; (g) to indicate the districts where sickness has broken out through importation of cattle and to prohibit further importation or exportation of other cattle, meats, bones, horns, milk, hair, wool, dogs, cats, or any kind of poultry, and to prohibit holding any markets, or public sales of such articles; (h) to prohibit any kind of animals or poultry from running loose in such districts; (i) to prohibit walking on the premises where animals which have died from contagious diseases are buried; (j) the appearance of any contagious disease among cattle is to be reported at once by telegraph by the chief government official of the infected district to the director of agriculture, who gives the necessary instructions and publishes notice of such cattle sickness in the Official Gazette of the colony. Further, if required, the chief government official of the infected district has the right to draft in workmen from the native population of the district.

**NUMBER OF HORSES, CATTLE, CARABAOS, HOGS,
GOATS, AND SHEEP IN THE PHILIPPINE
ISLANDS, BY PROVINCES, AT THE
BEGINNING OF FISCAL
YEAR 1911.**

	Horses.	Cattle.	Carabaos.	Hogs.	Goats.	Sheep.
Agusan.....	202	327	801	4,885	373	80
Albay.....	4,241	1,133	8,191	50,208	12,082	247
Ambos Camarines.....	495	1,218	12,305	34,527	21,681	1,153
Antique.....	270	5,532	13,842	28,254	6,326	586
Bataan.....	194	266	5,895	7,417	1,725	635
Batanes.....	19	5,358	1	2,560	991	229
Batangas.....	20,088	33,797	12,689	87,110	10,743	255
Bohol.....	2,351	8,923	25,384	520,453	4,675	276
Bulacan.....	2,651	1,342	30,765	59,278	6,674	717
Cagayan.....	7,008	10,784	29,206	26,162	5,060	2,090
Capiz.....	1,886	8,908	28,733	43,699	39,987	1,846
Cavite.....	4,605	3,245	8,672	34,052	1,761	189
Cebu.....	90,903	11,428	29,839	265,440	49,285	6,138
Ilocos Norte.....	11,916	6,938	35,532	37,708	12,054	5,996
Ilocos Sur.....	9,770	13,300	40,889	70,704	25,154	6,040
Iloilo.....	1,383	8,002	36,666	86,717	24,447	7,808
Isabela.....	3,734	2,246	21,756	14,822	2,389	1,119
La Laguna.....	6,409	1,715	12,873	24,303	3,681	204
La Union.....	1,826	3,703	18,054	18,739	13,988	3,073
Leyte.....	3,035	7,070	20,645	59,736	13,455	2,162
Mindoro.....	2,755	13,581	5,211	6,880	1,815	-----
Misamis.....	2,787	1,239	5,858	23,077	5,045	1,173
Moro.....	3,897	15,435	10,263	17,738	4,915	507
Mountain.....	3,024	14,628	11,393	24,748	4,525	1,787
Nueva Ecija.....	718	2,998	28,315	57,333	5,428	1,034
Nueva Vizcaya.....	489	680	4,230	5,366	730	94
Occidental Negros.....	1,516	10,769	31,384	45,615	25,065	22,032
Oriental Negros.....	4,660	3,821	11,871	37,136	20,060	3,580
Palawan.....	197	8,738	4,810	3,028	498	24
Pampanga.....	2,628	1,389	30,019	49,471	19,010	4,585
Pangasinan.....	3,779	12,168	68,129	100,310	20,159	2,118
Rizal.....	1,669	799	12,928	19,369	2,500	185
Samar.....	1,102	1,249	6,511	25,211	3,693	218
Sorsogon.....	3,166	5,981	10,544	36,210	7,357	813
Surigao.....	1,942	524	8,171	24,763	2,508	182
Tarlac.....	1,012	1,320	28,428	58,961	18,469	7,830
Tayabas.....	6,214	8,858	18,165	35,815	5,866	91
Zambales.....	1,133	3,886	12,040	20,800	2,363	1,649
Total.....	215,674	242,398	713,121	2,066,605	407,087	88,760

MONTHLY VETERINARY REPORTS—MAY AND JUNE.

In the Island of Luzon there have been no great changes in the rinderpest situation during the past month. Infection exists in the Provinces of Cagayan, Isabela, Mountain, Nueva Vizcaya, La Union, Tarlac, Pampanga, Bulacán, Bataan, Zambales, Cavite, Rizal, La Laguna, Batangas, and Pangasinan.

In all of the provinces above mentioned except Batangas and Pangasinan the situation is practically the same as at the time of the last issue of this publication. In Batangas, where the force has consisted of only one veterinarian and three inspectors, the number of infected municipalities has increased from one to three.

In Pangasinan, which is the only district of Luzon where an adequate force has been maintained, the results of the past month's work have been extremely gratifying. Ten municipalities in the eastern and central part of this province have been freed from the infection and except in the western mountainous district the infection has been so successfully curbed that only fifteen cases have occurred during the last two weeks. In the month of April all of the veterinarians who could be withdrawn from other provinces of Luzon were sent to Pangasinan which at that time harbored the most alarming outbreak that has occurred in these Islands for some time. At that time the infected area was so extensive that all of the force which it was possible to send to the work were unable to attempt eradication of the disease from all infected municipalities simultaneously. On account of this the campaign was started in the eastern part of the province with the view of gradually moving westward as the territory could be cleaned.

The animals in the infected localities were closely confined by being tied in order to prevent their becoming exposed by contact with cases of rinderpest which had not been discovered and isolated, and to prevent infection from streams and pastures. The tying of all animals susceptible to rinderpest is doubly necessary because the exposed individuals may transmit the dis-

ease to other susceptible animals for at least forty-eight hours before the appearance of any symptoms of the disease.

The tying of animals, together with other measures, has succeeded in accomplishing results fulfilling the highest expectations. In the eastern section of the province rinderpest has been practically eradicated and the forces have already moved westward to take up the campaign in the remaining infected localities. The results in Pangasinan have demonstrated that rinderpest can be quickly eradicated from a district whenever a sufficient force is available.

At present the situation in the Visayan Islands is much more encouraging than it has been at any time since this Bureau took up the work of controlling and eradicating animal diseases. In all of the southern islands, including Mindanao, only five municipalities are known to be infected. One of these is in the Province of Iloilo, one in the Island of Siquijor, one in the Province of Surigao, and two in the Island of Cebu. Of course, it is possible that disease exists undiscovered in a few localities and that the infection is still being propagated in the deer and wild hogs of the mountains, but there has been a marked improvement which may mean the complete eradication of rinderpest in one-half of the Philippine Islands within a few months.

MONTHLY CROP REPORTS—MAY AND JUNE.

ABACÁ.

Albay.—There is very little movement in abacá, although the finer grades are seen more frequently than formerly. The hemp growers claim that a relative higher price is paid for the lower grades of fiber than for the better grades, hence some of the hemp growers are again producing low grades of hemp.

Ambos Camarines.—The grade of abacá produced in the Lagonoy section is so low that it is hardly worth the labor and cost of harvesting.

Leyte.—The price of abacá is still very low with no signs of a strengthening market.

Samar.—In the vicinity of Borongan a great deal of abacá is now being placed on the market and prices are very good.

Sorsogon.—The price of the best grade of abacá has dropped about 50 centavos a picul and many complaints are heard about the poor price being paid.

COCONUTS.

Ambos Camarines.—More attention is now being given in the Lagonoy district to coconuts than to any other crop.

Cotabato.—During the month of April some 2,000 coconut trees were planted at Kusiong and about 5,000 were planted in the vicinity of Tamuntaka.

Misamis.—Considerable areas have recently been planted to coconuts in the Island of Camigin.

Samar.—The coconut trees appear to be reviving rapidly from the effects of the late baguio and the fruit, though young, is plentiful. Copra is selling at 14 centavos per kilo and coconuts at ₱3 per hundred.

CORN.

Antique.—There is some fear that early and rather heavy rains will damage the corn crop in the southern part of the province, but at the present time corn seems to be in excellent condition and appearances indicate that the crop will be unusually large.

Cebu.—During the month of April 1,692 hectares were planted to corn and about 456,120 liters were harvested. The price of corn has been from 4 to 6 centavos per liter. The condition of this crop has been only fair.

Leyte.—A large amount of corn has been planted in different parts of the province; the municipality of Burauen alone having approximately 400 hectares of fine corn.

Oriental Negros.—A few good rains during the latter part of April stimulated the farmers of this province in the work of preparing land for the corn crop and it appeared that considerable planting would be done early in May.

MAGUEY.

Cebu.—During the month of April 1,010 hectares of maguey have been planted and about 6,500 kilos have been harvested. The price has ranged from 10 to 12 centavos per kilo. Condition of crop fair.

RICE.

Albay.—During the latter part of April the people in the hills were preparing their land for the mountain rice crop. The farmers of Libon will try this year to raise two crops of rice, planting in May and September. The rice mill recently established at Ligao is running every day and all palay that is offered to this milling company is being purchased.

Ambos Camarines.—The harvest season at Daet and the other towns of northern Camarines is now nearly over and it is estimated by some of the most conservative and intelligent residents of that section that the present crop will amount to nearly 60,000 cavans of palay, which, if these estimates are correct, will give that section of the province approximately 30,000 sacks of rice. This crop will add very materially to the resources of that section and will greatly ameliorate the present rather depressed economic condition of that part of the province.

Reports from the Lagonoy district indicate that the rice crop was so light in many parts of the country around San Jose that the farmers are discouraged and claim that the cost of production exceeded the value of the crop harvested.

The rice crop in the central part of the province has been harvested, and as it is not quite time to begin breaking land for the new crop very little agricultural work is being done.

Bohol.—The conditions of agriculture on the Island of Bohol appear to be very promising. The farmers are taking advantage of the recent rains and are preparing new land for rice and

corn. It has been reported, however, that in a few sections the local food supply is nearly exhausted.

Bulacan.—The recent rains have softened the ground and many farmers have commenced their annual spring plowing preparatory to putting in the rice crop.

Cotabato.—Throughout the valley the Moros are clearing large areas and preparing their fields for the planting of rice. During the month of April 850 cavans of palay and about 700 cavans of rice were shipped out by the Chinese merchants of Cotabato.

Iloilo.—The rainy season started about two months ahead of time this year and if it keeps up a good rice crop should be harvested.

Pampanga.—In the vicinity of Arayat land is being prepared for rice planting and a good crop is anticipated because of the timely rainfall.

Samar.—In the vicinity of Basey the people are busily engaged in clearing new land and planting rice. The inhabitants of this locality are anticipating much better times this year than last. In the vicinity of Borongan and the east coast the demand for rice is still very great and prices are high. Rice now sells at ₱7.50 per sack. In some parts of the province a fine rice crop is reported, but in other sections only about one-third of an average crop.

Sorsogon.—The harvesting of rice was started during the month of April, but owing to frequent rains not much progress was made. The rice crop, on account of the heavy rains, should be much larger than last year.

Tarlac.—The first crop of rice is about ready to harvest and appears in good condition, having had an abundance of rain during the past six weeks.

Zambales.—The farmers were principally engaged throughout the month of May either in plowing their rice lands or in preparing and planting their rice seed beds. During the first two weeks of the month there was sufficient rainfall for agricultural purposes, but the latter half of the month was very dry and rain was very badly needed the first of June.

SUGAR CANE.

Antique.—Cane grinding was completed during the month of April. A conservative approximate estimate of the crop places it at 77,000 piculs.

Cebu.—The condition of the sugar cane crop has been excellent.

La Laguna.—The unprecedented rains during the middle of April caused great loss to the planters. It appears that much cane will be left in the fields, as the rains and limited milling facilities will prevent its harvest.

La Union.—The sugar crop has been bountiful but the price was low.

Occidental Negros.—The milling of sugar cane continues in all parts of the province. Owing to numerous showers from time to time, milling has been somewhat delayed. The labor question is becoming more acute, and it is feared that more or less cane will be left in the fields, owing to lack of hands to harvest at the proper time.

Pampanga.—The planters of Pampanga have harvested and milled all of their sugar crop and are busy drying and packing their sugar preparatory to storage or shipment. Partly owing to difficulties of transportation, due to the prevalence of rinderpest, and partly to the low price of sugar, the majority of the sugar planters are storing their sugar in anticipation of a rise in price later in the season.

Tarlac.—There has been a large demand this year for "seed" for planting and in some localities the local supply has been insufficient. The increased growing of sugar cane in this province should be encouraged.

TOBACCO.

Iloilo.—Some injury has been done to tobacco by the excessive rains.

Isabela.—From present appearance the tobacco crop will be much smaller than last year but of a superior quality. The frequent showers through the central and north central part of the province during the month of April greatly benefited the tobacco crop and are largely responsible for the superior quality of leaf in the vicinity of Tumauni, Ilagan, and Cauayan. Some few people throughout the province are drying their tobacco under sheds, but the majority of them still cling to the old system of curing tobacco in the sun, which seriously injures its quality.

La Union.—The tobacco crop is nearly all in and it failed to come up to expectations, owing to drought. Some difficulty is being experienced by the large buyers in getting the tobacco in from the barrios, because of quarantines on account of rinderpest.

Leyte.—As a result of the low price of abacá the acreage given over to the cultivation of tobacco is double that of last year.

NOTES FROM OTHER FIELDS.

ESTIMATED COST OF LAYING OUT A RUBBER ESTATE.

Tropical Life (Vol. VII, No. 3) gives some interesting information by Mr. Wicherly on the cost of planting up a rubber estate. He says:

The preliminary work of marking off the various fields—which should average 40 acres each, inclusive of paths—detaching the areas which are to provide wind belts, and selecting the sites for cart roads, bungalows, factory, stores, etc., must be done before the clearing contractors are permitted on the land, and a clearly marked sketch of the estate made for the guidance of all concerned. In Ceylon, India, and the Straits Settlements contracts for this kind of labor may be readily placed with the certainty of getting the work done well and expeditiously.

Planting contracts and contracts for buildings, etc., must be arranged separately, and be protected by fines for unnecessary delay or noncompliance with the agreed terms. On the other hand, it is always good policy to offer a bonus for work well and duly completed inside the period allowed.

Hevea brasiliensis is best cultivated from “stumps” and planted 220 to the acre; two important factors which must be taken into account in arriving at an estimate of the ultimate cost of bringing an estate into bearing. The following figures are taken from an estate account appertaining to a property in Ceylon situated nearly eighteen miles from a station and four miles from a Government cart road. It may safely be accepted in all its particulars as to cost, as a fair example of rubber planting, as a whole, not only in that island but in the Mid-East generally:

Contract for clearing and burning (say 460 acres).....	£750
Contract for roading and draining	150
Contract for supplying and planting 101,000 Pará “stumps”	2,100
Contract for factory, bungalows, coolie lines, machinery, tools, and well sinking	3,750
Contract for weeding and maintenance—	
Charges first year	900
Charges second year	570
Charges third year	510
Charges fourth year, including coast advances 250 coolies	915
Making a total of	9,645

which is not quite £21 per acre.

As against this outlay, the estimate of rubber returns for the fifth year (1910) was more than realized. It amounted to 5,120 pounds, and sold for 380

5s. 1d. per pound net. The estimates for 1911 fix the output at 30,000 pounds, the greater portion of which has actually been sold forward at 5s. per pound.

AGRICULTURAL AND TRADE CONDITIONS OF SAMOA FOR 1909.

In the *Agricultural News* (Vol. X, No. 230) we find an interesting note with regard to the export trade of Samoa for 1909. It is stated that the total exports for that year were valued at ₧1,468,380.96, and the chief of these were copra, valued at ₧1,253,909.16, and cacao, valued at ₧197,403.48.

Rubber plantations which have been recently started are doing well, and it is thought that if success is obtained in this direction, there will be a great increase in the area occupied by this plant. The Government controls all the lands owned by the natives and there are large tracts owned by Europeans. Considerable progress is being made in coconut planting, the trees being planted between cacao trees that already exist. It is stated that this planting of cacao land in coconuts has been brought about chiefly through the appearance of a cacao canker which, while it can be kept in check by constant attention, causes a large amount of damage if it is neglected.

COCONUT BUTTER.

The *Cuba Review* (Vol. IX, No. 3) states that a new substitute for butter has been placed on the market in western Bohemia. This contains no animal fats, but is manufactured from coconut oil, the yolk of eggs, and a small proportion of cream. The coconuts are imported by the shipload by way of Hamburg, up the Elbe River to Aussig, where the factory is located. The entire coconut is utilized in various ways; the meat is pressed for the oil, the outer fibrous coat is used in the manufacture of mats, and the hard shell is made into buttons. For some time coconut oil has been used in Europe in the manufacture of oleomargarine but in combination with lard or other animal fats.

The "vegetable" butter is prepared in two forms, soft and in firm cakes. It is shipped by parcels post from the factory in packages of 5 kilos (11 pounds). It is claimed that this butter substitute has an agreeable flavor, is not injurious to health, and is excellent for cooking purposes. It retails for about ₧0.62 a kilo.

It is said that owing to the fact that the oil from coconuts is now being extensively converted into comestible fats, its market

price has increased enormously, and the world is being sought for additional supplies of coconuts.

PINEAPPLES AS A CATCH CROP FOR RUBBER.

It is stated in *Tropical Life* for April that if there was a favorable market for pineapples this should make a good catch crop between *Hevea* trees, if widely planted. We quote the following statements with regard to the value of this crop:

A plant suitable as a catch crop must have the following qualities: (1) It can grow without interfering with the rubber or retarding the growth of the latter. (2) It must mature and fruit early. (3) It must not have woody roots, which may become liable to be the sites of disease. (4) It can be easily removed without much cost and without doing harm to the roots of the rubber trees. (5) It must not harbor diseases of an infective character.

Away from a remunerative market, the fruit is, unfortunately, a dead loss. At the same time, as the fruit is said to flourish in all localities suitable for the planting of *Hevea*, and since the plants fulfill the above requirements of a satisfactory catch crop, it would be worth trying to develop a trade in the fruit. Failing this, possibly, if the fruit was cut out soon after forming, or even not allowed to form, the fiber contents of the leaves could be strengthened and developed sufficiently to make it pay to extract and export the fiber instead of the fruit. Then *Hevea* would have in pineapples what Ceará enjoys with sisal (*A. sisalana*) as a subsidiary or catch crop.

Should a planter decide [continued our Eastern contemporary] to raise pineapples, he must determine the system of spacing his rubber trees. On the whole one must recommend wide planting, allowing for avenues 30 feet wide and trees 15 feet apart to form the sides. Thus planted, 30 by 15, the *Hevea* trees will develop to the best advantage both their root and leaf systems.

The pineapples should be planted 3 feet away from each rubber plant, and the lines should be so arranged on hill slopes that they serve as terraces to prevent too much wash from rain water. In this way we can get in, say, about 2,000 pineapple plants in an acre. They flower in fifteen to eighteen months and thus a first crop is certain in the second year. In the third year, a large and secondary crop may be expected. After the fourth year the crop begins to deteriorate unless the plants are properly looked after. The main cause of the deterioration is that the pineapple is purely a surface feeder, and as usually the soil on which it grows has been allowed to become completely denuded, the fruit goes back if no attempt is made to restore to the ground the decayed leaves, which in the case of pineapples take a long time to become humus.

Soil exhaustion by the plants could be greatly minimized with attention and by a judicious use of manures, but for keeping down weeds, discouraging soil erosion, helping to isolate the belts of rubber trees, and keeping the soil open and aerated, pineapple plants certainly have many points in their favor, apart from any profits to be derived from their fruit or fiber.

RUBBER CONDITIONS IN MEXICO.

The Bulletin of the Department of Agriculture of Trinidad (No. 67) states that in Mexico, India rubber is obtained from two different plants, *Guayule* and *Castilloa elastica*. In the fiscal year 1908-9 the total export amounted to 6,015,173 kilos, the respective proportions of *Guayule* and *Castilloa* being 5,601,858 kilos and 413,315 kilos. The expectations with respect to the *Castilloa* tree have not been fulfilled. In Paleuque there are well-developed 14-year-old trees yielding no latex, while in the Isthmus 7 or 8 year old trees in normal conditions give 90 to 120 grams (3.2 to 3.5 ounces) per year. The most promising *Castilloa* plantation has an area of 500 hectares with 350,000 trees 6 to 8 years old which yield an average of 73.6 kilos per hectare of commercial raw rubber. The total area planted to *Castilloa* is estimated at 36,000 hectares, and taking the yield for a 10-year-old plant as 150 grams (5.3 ounces) and assuming that there are 500 trees per hectare, then the yield of plantation rubber in the year 1915, given favorable weather conditions, may be estimated at 2,700,000 kilos.

THE PRODUCTION OF SUGAR IN JAVA.

The International Sugar Journal (vol. 13, No. 147) gives the following details with regard to the sugar production in Java for the season of 1909-10:

One hundred and eighty-two factories were at work during the period; of these, 161 sent in data to the Manufacturers' Association. They produced 1,150,127 tons of sugar as compared with 1,123,822 tons in 1908-9. Since the total production of sugar in Java in 1909 was 1,241,726 tons, then, assuming the factories unaccounted for do not increase their output, the 1910 total is estimated at 1,278,420, an increase of 2.9 per cent. The plantings in 1910 amounted to 314,335 acres; those for 1911 are expected to cover 325,130, an increase of 3.4 per cent.

A CENTRAL SUGAR FACTORY IN ST. KITTS.

Some interesting comments on sugar conditions in the British West Indies with regard to central sugar factories are published in the International Sugar Journal for March, 1911. The article states that a company has already been formed in London for the erection of a central sugar factory in St. Kitts and preparations are being made to begin construction at once. A similar company was brought out about six years ago in Antigua and has been successfully worked, and the new undertaking in St. Kitts will follow along the same lines.

It is expected that the coöperation between cane grower and

sugar manufacturer will result in substantial benefit to owners of sugar properties in the West Indies, and more especially to the smaller planters who have been financially handicapped. With their limited resources it was difficult to turn out cane of the best quality and also to produce sugar of sufficiently high saccharine value to compete in the open market with countries like Java, Cuba, and Mauritius, which grow cane on a large scale and have all the best modern machinery. Under the new system the planter is released from manufacturing his product and is able to devote the whole of his capital and time to the production and improvement of his crop, while the process of manufacture is transferred to a central mill managed by professional engineers and chemists.

The Antigua company had for its object the mutual coöperation of planter and mill owner, and we quote the following with regard to the general management:

In the first place the planters entered into an agreement with the factory to grow and deliver for a term of fifteen years cane sufficient to supply the factory, the capital for the erection and working of which being obtained partly by a loan of £15,000, free of interest, from the government of the Leeward Islands and partly by the issue of shares and debentures to the amount of £25,000 by a company formed for the purpose of building a central factory.

The results for the six years have been eminently satisfactory and are creditable to the management and encouraging to the new enterprise.

The company at St. Kitts, while run on the same general lines, will not receive any assistance from local authorities, and it is thought with good management the business is capable of doing as well as its predecessor, especially as the factory will be constructed on a larger scale, and the cane which supplies it comes from a very fertile island.

It is understood that a railway will be constructed to facilitate the delivery of a large and regular supply of cane, and it is suggested that considerable expense might be saved by the employment of motors using oil fuel. In view of the severe competition of the present day, it is also advised that as the planters are relieved from the burden of manufacturing their product, their attention should be directed toward the employment of modern agricultural machinery and intensive cultivation.

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR MAY.

By KER & Co.

[Based on advices from New York, April 7, San Francisco, April 12; London, April 12; Hongkong, May 12; Iloilo, May 13; Cebu, May 13.]

SUGAR.

Iloilo.—We quote No. 1, ₱7.375; No. 2, ₱7; and No. 3, ₱6 per picul; holders are firm. Nearly half this season's crop has now been exported.

Manila.—Quotations unaltered but buyers more reserved.

Cebu.—Nothing reported in the interval.

HEMP.

For better qualities market has continued very dull, but for lower grades is steady on the basis of ₱7.50 United Kingdom and ₱7.75 United States current per picul first cost f. o. b. Good current may now be quoted ₱14 per picul first cost f. o. b. Receipts for the fortnight at all ports 54,338 bales.

COPRA.

Market advanced to ₱11 Cebu fair merchantable sun dried, and ₱10.50 Manila fair merchantable per picul first cost f. o. b.; at the close values are 25 to 50 cents per picul easier.

MANILA AND LONDON FIBER MARKET.

Receipts and shipments of Manila hemp.

[Telegram from Manila to London, June 12, 1911.]

	1911	1910
Hemp receipts at:	<i>Bales.</i>	<i>Bales.</i>
Manila since January 1	470,350	464,171
Cebu, etc., since January 1	136,469	147,948
All ports since January 1	606,819	612,119
Shipments by steamer to:		
United Kingdom, cleared since January 1	257,167	203,716
Atlantic coast, United States, cleared since January 1	170,203	228,899
Pacific coast, United States, cleared since January 1	60,539	49,433
Continental ports, cleared since January 1	52,135	27,843
Shipments to:		
All other ports	31,905	
Local consumption since January 1	5,000	
	36,905	32,505
Loading steamer on the berth for:		
United Kingdom, about		3,000
Atlantic coast, United States, about	10,000	10,000
Pacific coast, United States, about	14,000	3,000
Loading per sailer for Atlantic coast, United States		20,000

Bales of hemp loading for United States, by steamer :

Indravelli 10,000

Bales of hemp loading for Pacific coast, by steamer :

Imerio 12,000*Manchuria* 2,000

FIBER QUOTATIONS.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, and Messrs. Sloan & Mitchell, of Manila, on April 26, 1911.¹

Manila hemp.—Fine marks have been dealt in at figures which are again in favor of buyers. The market for spot hemp has ruled quiet, without change in value, viz, £19 to £19 5/- for fair current in store, and £18 15/- for dock parcels, also good brown at £18.

Range of prices.

Grades.	London.			Manila, per picul.
	Spot and close by.			
	Per ton.	Per ton.	Per picul.	
Best marks -----	43/- to 46/-	₧430.00-460.00	₧26.90-28.75	-----
Good marks -----	41/- to 42/-	410.00-420.00	25.62-26.25	-----
Good current -----	33/- to 34/-	330.00-340.00	20.65-21.25	₧14.60
25 per cent over current -----	22/6 to 23/-	223.00-230.00	13.95-14.35	8.20
Fair current -----	19/- to 19/6	190.00-193.00	11.85-12.10	-----
Superior seconds -----	18/6 to 18/9	183.00-184.50	11.45-11.55	7.20
Good seconds -----	18/3 to 18/6	181.50-183.00	11.35-11.45	7.00
Fair seconds -----	18/- to 18/3	180.00-181.50	11.25-11.35	-----
Good brown -----	17/9 to 18/-	174.50-180.00	10.90-11.25	-----
Fair brown -----	17/9 to 18/-	174.50-180.00	10.90-11.25	-----

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

Sisal hemp.—The market is lifeless. The quotation in New York is nominally 4 cents, equal to £19 10/- charges including freight London for fair average quality, and £20 5/- for selected per ton.

Manila maguey.—Values £16 to £16 10/- No. 1, £14 10/- to £15 No. 2, and £13 10/- to £13 15/- for No. 3.

The Manila quotations for the same date were ₱6.40 per picul for No. 1.

ILOILO SUGAR MARKET FOR APRIL.

Sugar was received from the mills and sugar districts during the month of April, amounting to 364,105 piculs. The market for the sugar crop opened April 1 at 6 pesos and $3\frac{1}{2}$ reales,¹ and on the 17th the price went up to 6 pesos and $5\frac{1}{2}$ reales where it continued until the 19th, on which day it advanced to 6 pesos and $6\frac{1}{2}$ reales. Beginning on the 22d it dropped gradually, standing at 6 pesos and $2\frac{1}{2}$ reales at the close of the month.

April shipments.

[In piculs.]

Date.	Vessel.	Destination.	Superior.	Wet.
Apr. 6	Beachy.....	New York.....	88,000	-----
Apr. 7	Seneca.....	do.....	56,000	-----
Apr. 21	Kennebec.....	do.....	80,000	-----
Apr. 22	Epsom.....	San Francisco.....	40,400	-----
Total for April.....			264,400	-----

Exports up to May 7, 1911.

Date.	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet.
United States.....	424,800	-----	475,600	-----
China.....	64,575	486	135,972	29.38
Total.....	489,375	486	611,572	29.38

¹ One real equals $12\frac{1}{2}$ centavos.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— APRIL, 1911.

By the INSULAR COLLECTOR OF CUSTOMS.

[Values in dollars, U. S. currency.]

IMPORTS.

Articles.		Manila.	Cebu.	Iloilo.	Totals.
Rice -----	{Kilos.-----	9,840,763	7,045,950	3,576,094	20,462,807
	{Value -----	369,517	205,452	129,611	704,580
Beef cattle -----	{Number.-----	3,737			3,737
	{Value -----	86,745			86,745
Eggs -----	{Dozens.-----	387,706	94	168	387,971
	{Value -----	27,294	11	20	27,325
Sugar -----	{Kilos.-----	190,849	21,683	7,964	220,496
	{Value -----	12,840	1,698	566	15,104
Coffee -----	{Kilos.-----	19,537		210	19,747
	{Value -----	5,528		115	5,643
Cacao -----	{Kilos.-----	68,163	7,602		75,765
	{Value -----	18,265	1,999		20,264
Raw cotton -----	{Kilos.-----	151			151
	{Value -----	56			56

EXPORTS.

Hemp -----	{Kilos.-----	12,899,561	3,370,720		16,270,281
	{Value -----	1,237,372	320,139		1,557,511
Copra -----	{Kilos.-----	7,239,185	3,031,691	302,074	10,572,950
	{Value -----	471,490	243,856	23,000	738,346
Sugar -----	{Kilos.-----	11,853,017		19,391,403	31,244,420
	{Value -----	621,952		1,009,325	1,631,277
Cigars -----	{Thousand.-----	10,374			10,374
	{Value -----	140,007			140,007
Cigarettes -----	{Thousand.-----	2,414			2,414
	{Value -----	1,799			1,799
Tobacco -----	{Kilos.-----	1,280,599			1,280,599
	{Value -----	180,712			180,712

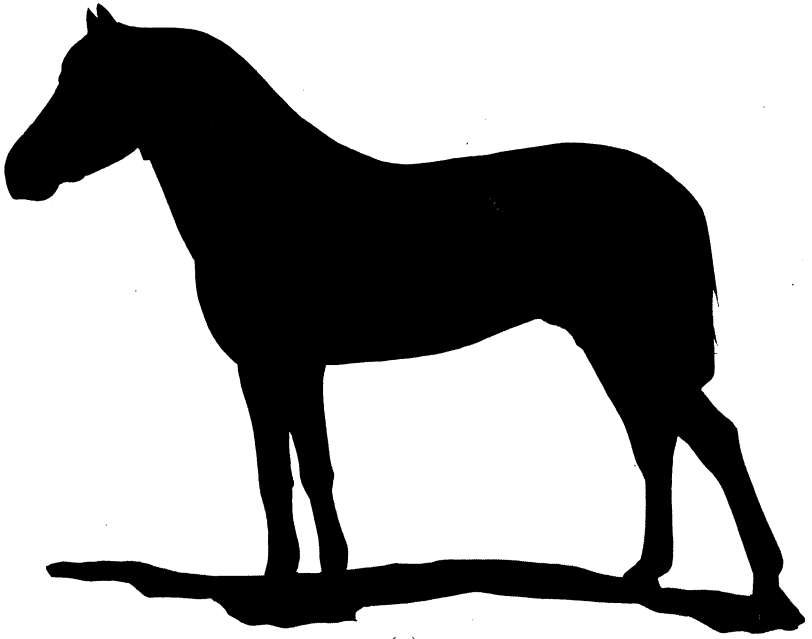
TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES—MAY, 1911.

By the DIRECTOR OF THE WEATHER BUREAU.

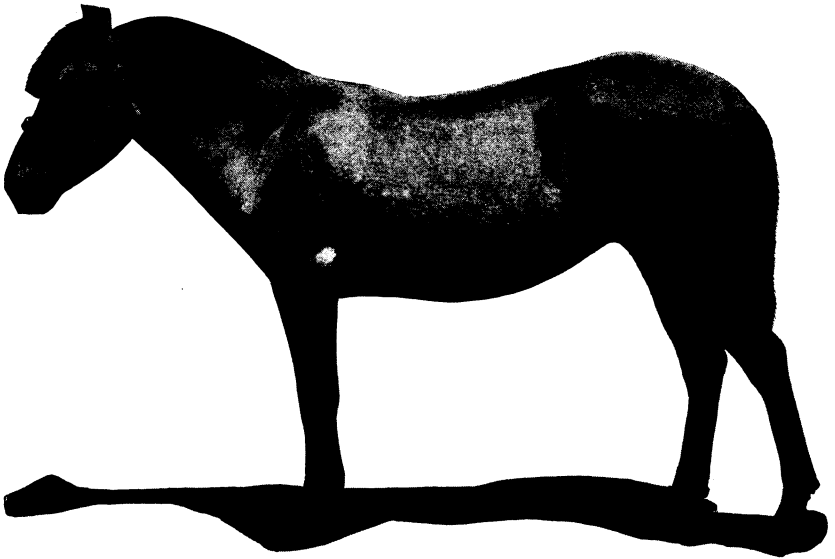
[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	27.5	5.6	27.4	0.5	26	4.3	29.2	26.2	27.9		27.9	
2	26.5	7.1	26.8		25.3	23.6	29.8	25.9	28.4		28.4	
3	26.1	3.3	27.5	3.6	26.2	2.3	28	25.5	28.3		28.3	
4	27	9.7	27.1		26.4	7.1	28.4	26.6	28.4		28.4	
5	26.4	6.4	26.9		26.1	1.1	27.6	27.2	28.9		28.9	
6	26.8	9.4	26.6		26.6	1.3	28	27.5	29.4		29.4	51.3
7	26.2		26.8	10.7	26.3		27.7	26.9	0.8		27.2	5.6
8	26.5		27		27.1		27.6	1	40.9		27.2	.3
9	27.2		28		26.3		28.2	25.1	28.7		28.2	.3
10	27.2		27.4		26.6	20.1	28.8	25.5	6.4		27.4	
11	28.4		26.9	7.4	27.6	.5	28.9	6.4	26.8		28	
12	29.3		28.2	1.8	28.1		29.3	3.8	27.2		27.4	.3
13	28.9		25.2	25.4	28		28.5		27.3		27.6	.5
14	28	49	25.7	17	26.9	7.6	29	1.5	26.8		28.2	
15	28	11.9	26.7		26.4	1.8	29	1.3	26.9	15.2	28.4	
16	26.6	10	25.5	26.7	26.8	2	27.9		26.8		29.8	.8
17	27.5		26.7		27.2		28.4		27.3		28.2	.5
18	27.3		26.4		27.1		28.8	1	27		27.6	.5
19	27.7		27		27.1	14	28.5		26.6		28.3	
20	28		27.4		27.2		28.6		27.7		28.9	
21	28	2	28.1		27.6	3.3	29.6		28		29	
22	28.7		28.2	8.3	29	.5	29.5	1.3	27.8		28.7	
23	28.3		28.2		28.6		29.8	12.7	27.8		28.6	
24	28.6		28.2		28.5	.3	29		27.1	2.5	29.2	
25	28.4		28.5		27.3		29.5		26.8		28.9	
26	28.7		28.7		27.2		29.8	1.8	28	42.9	28.8	
27	28.5	1.3	28.7		28.2		29.8	.8	27.8		29.4	
28	29.4		28.6		28.5		29.4	2.3	28		29	
29	28.5		28.7		28		29.9	14	27.9		30.2	
30	28.5	.8	28.8		28.1	16.3	29.6		27.8		29.4	.3
31	28.5		27.5	10.9	27.4	13.2	29	6.6	27.6		28.6	4.3

**MISSING
PAGE(S)**



(a)



(b)

PLATE I.—(a) "CARBONERO," NATIVE STALLION; HEIGHT, 137 CENTIMETERS (54 INCHES). (One of the sires being used on the Government stock farm at Alabang for pure native horse breeding.) (b) "ULILA." NATIVE MARE. (Property of the Bureau of Agriculture.)

LIVE-STOCK NUMBER

THE PHILIPPINE *Agricultural Review*

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EDITORIAL.

ANIMAL INDUSTRY IN THE PHILIPPINES.

The present number of the REVIEW is devoted entirely to the subject of animal industry in the Philippines. The previous number was devoted to the general subject of forage supply and its production.

During the past ten years a great deal more has been said on the negative side of the live-stock business of the Philippines than on the positive or constructive side. This has been due to the fact that there have existed here to a greater or less extent some of the fatal epizootic animal diseases which have caused some losses among the draft animals and slaughter cattle. A careful study of conditions pertaining to animal life in these Islands indicates that these diseases have not been nearly so severe as they are generally believed to have been. As a matter of fact all classes of live stock in the Philippines, with the exception of horses, have steadily increased in numbers since the American occupation, and it is quite certain that the apparent shortage in animals necessary to supply the local markets has been due rather to an increased demand since the restoration of peace than to a reduction in the animal supply by reason of epizootic diseases.

There is more live stock in the Philippines at the present time than there has been at any previous time since American occupation. During the last decade of the Spanish régime there was a notable increase in the number and size of the herds of cattle. It should be noted, however, that the apparent abundance of animals during this period was largely relative, as wages were much lower and the purchasing power of the people correspondingly small. There is no doubt that the conditions for the actual production of live stock were then more favorable than they are at the present time, as there was less danger of losses from disease, foundation stock was cheaper, and the cost of labor was much less.

Stock raising in the Philippines is, relatively speaking, more profitable now than it was fifteen or twenty years ago, as there are advantages which more than offset the difficulties attending the business at the present time. The many natural advantages which this country enjoys, especially in the large areas of available open land, abundant water supply, and salubrious climate, make it an almost ideal live-stock country. It is one of the few places left in the world where large ranges and correspondingly large herds are still possible. It will probably be from a quarter to half a century before much of the unoccupied land of the Islands will be required for strictly agricultural purposes. In the meantime the most economic use of this domain is to devote it to grazing and forest purposes. There may be some prejudice among stockmen who are accustomed to the larger classes of animals against handling the small Philippine ponies, the Oriental types of cattle, and the ungainly carabao. Persons who hold such opinions would do well to avoid the common error of assuming

that everything to which they have been accustomed at home is better than that which is produced in the Orient. The domestic animals in the Philippines are a product of existing conditions which have acted to create forms of animal life best suited to those conditions. The Philippine pony is the best horse to raise for the Philippine markets. In fact, this pony, considering his size and the conditions under which he has been produced, is one of the best horses in the world. The ponies of these Islands can be greatly improved but this should be done mainly by selection and care rather than by the importation of breeding stock from other countries. If foreign blood is to be introduced there is no doubt that it should be from the same sources which gave origin to the Philippine pony, particularly the Arabian stock.

The same general conditions apply to the improvement of cattle, carabaos, swine, goats, and poultry in these Islands. The most important requirement in our local animal industry at the present time is an increase in the number of hardy, fearless class of settlers who have developed the live-stock industry in the southwestern part of the United States. There is ample room both for the local stock people who may wish to develop their business here and for any others who may desire to engage in stock raising in this country.

It is believed that this number of the REVIEW contains material which should give all interested parties a fairly good understanding of the live-stock business as it exists in the Philippines to-day, as well as the future prospects for this industry.

LIVE STOCK AND POULTRY IN THE PHILIPPINE ISLANDS.

INTRODUCTION.

To the close observer, familiar with conditions under which live stock is produced in the different countries of the world, the many natural advantages of the Philippine Islands over other countries are very noticeable and are constantly magnified as a more perfect knowledge of the Islands is acquired. A country where protracted droughts are not known, where grass grows during twelve months of the year, where running water is nearly always and everywhere abundant, where millions of acres of public domain covered with good grass lie unoccupied and unused, and where artificial shelter is not necessary; such is surely a country of great promise. In addition to the many favorable conditions for the production of animals that make the Islands so alluring to the stock raiser, the present high prices, the large demand, and the indication that the prices will go higher and that the demand will increase, are also factors of great importance. There may be other countries where live stock can be produced as cheaply, but it is very doubtful if in any of these countries there is as good a market as here. At the present time, in most countries where the demand for live stock equals or exceeds the supply, the cost of production is a very material factor; and in many countries where the cost of production is low export trade must be relied upon. While export trade is always satisfactory when once it has been established, stock raising is a very unsatisfactory undertaking in a country where this trade must be relied upon but where it has not yet been well developed. The Philippine Islands offer the most promising situation to the producer in that the country is importing annually live stock and live-stock products to the amount of ₱8,686,512.58 (see Appendix III), and in that there are at present lying idle approximately 36,000 square miles of unoccupied public lands upon which all of these imports could be produced. With the present rate of development the demand for live stock and live-stock products should more than treble during the next ten years.

The great numbers of cattle and horses in the Islands in the early eighties, before the advent of surra and rinderpest, prove that many conditions here are ideal for their production. In fact, paradoxical as it may seem, the ease with which animals could be produced and the rapidity with which they increased, is in a large measure responsible for the small number in existence to-day. Animals all thrive so exceedingly well and increased so rapidly that it had the effect of causing the inhabitants to neglect their herds, in some cases quite to the point of letting them "run wild." Upon the arrival of the contagious diseases, which have so deplorably decimated the herds of the country, the habit of inattention had become so fixed upon the people that practically nothing was done by them to protect their animals. Those who had been spared a few animals still continued to neglect them, regardless of the high prices and the great demand. Others, who have been in the position to acquire herds, have seldom done so, believing that disease is inevitable and that all efforts toward protection would be of no value. Nearly every one who is acquainted with conditions in the Islands will say that the live-stock business affords the best opportunity for investment that we have here, were it not for contagious diseases. In most cases the fear of these is sufficient to cause people to invest their money in other ways.

Though it is true that contagious diseases did destroy a great many animals, it is equally true that during the last few years their presence has done far more damage by keeping people from engaging in the business than it has in the destruction of animals. It may be a surprise to some, and yet it is a fact, that during the last three years the death rate of animals from this cause during any one year has not equalled 2 per cent of the total number. It may be seen by referring to pages 410 and 411 of Volume IV, No. 8, of the PHILIPPINE AGRICULTURAL REVIEW, that animals of all classes are steadily increasing. Yet the fact that the demand is increasing even faster than the supply causes most people who have not particularly investigated conditions to believe that the total number of animals is decreasing rather than increasing. It is a remarkable fact that more animals in the Philippine Islands die each year from neglect than from contagious diseases. The males are very seldom castrated and the herds are often composed of more males than females. The number of new-born animals that are constantly gored and trampled by these males can easily be imagined by any one familiar with live stock.

The selling of the best males and breeding from the poorest, as well as the general inbreeding, has resulted in the deterioration of all classes of animals in the Philippines with the possible exception of carabaos. Their constitution has been impaired and their size has been decreased to the point that their money value is only 30 to 50 per cent of what it should be. The most noticeable characteristic of Philippine animals is their exceeding prolificacy. The percentage of nonbreeding females is always so low as to be really surprising. The young of the native animals are exceedingly vigorous and always live if given a reasonable chance.

Tuberculosis, which is causing so much damage in most countries of the world, is practically unknown among the native animals here. In fact, animals of this country, in comparison with those of other countries, are exceptionally free from diseases. That herds can be protected from the two damaging diseases that are present—*i. e.*, rinderpest and surra—is not only theoretically possible with very little trouble and expense, but has been proven possible through practical experience with many herds in which these diseases have never appeared.

The climate, soil, and vegetation of the Islands are so well described by Mr. H. N. Whitford, Ph. D., forester, chief of division of investigation, in the Bureau of Forestry Bulletin No. 10, Part I, that the following extract is here given:

There is little question that practically the entire land area of the Philippines, from sea level to the highest mountains, was originally covered with unbroken forest growth of some kind. The following represents the present classes of vegetation, with the estimated area of each:

Classes of vegetation.	Area (square miles).	Percent- age.
Virgin forests	40,000	33½
Second-growth forests	20,000	16½
Grass lands	48,000	40
Cultivated lands	12,000	10
Total	120,000	100

Put in another way, the land area of the Philippines is about equal to that of the State of New Mexico, while the virgin forest area is approximately equal to the entire area of the State of Kentucky.

GRASS LANDS.

The large grass areas, called cogonales, are covered principally with two species—cogon grass (*Imperata exaltata*) and talahib (*Saccharum spontaneum*). Such areas are known as cogonales. They are mainly the

result of a shifting system of agriculture, which is prevalent throughout the tropics and known in the Philippines as *cañgin* making.

Cogonales originate in the following manner, and remain as such so long as fires prevail. Usually a small portion of original or second-growth forest is cut during the dry season, the timber and brush are allowed to dry, and are then partially burned. The area thus prepared is planted with rice, sweet potatoes, corn, or other crops.

Cultivation then practically ceases, and the jungle growth, consisting of grass, weeds, and tree species, quickly gains ascendancy over the planted crops, and at the end of the first, second, or third year the *cañgin* maker abandons his clearing for a new one in another patch of forest. If the jungle growth is set on fire, as is frequently done, nearly all plants except the grasses are killed. In this way through many years vast areas of forest lands have been converted into cogonales, and repeated firings have prevented any change in their vegetation. Abandoned areas, formerly more intensively cultivated, have also become changed to grass lands in the same way. It is surprising how quickly this grass will become dry enough to burn. Three or four rainless days will permit it to burn with sufficient heat to kill nearly all the seedlings of woody species. Grass lands are prevalent on land of nearly all types of topography, from sea level to the tops of the mountains. In the pine region of central and northern Luzon other species of grasses frequently take the place of the cogon, although these grass lands originated in the same way.

The grass lands are a detriment rather than a help to agricultural development. They seem to be the favorite breeding places of grass-hoppers which frequently destroy growing crops. It is very expensive to bring them under successful cultivation, for they form dense masses of roots and underground stems which several plowings will not entirely kill. Many Filipino farmers prefer to prepare for cultivation the land covered by virgin or second-growth forests. Indeed, in some instances they will first plant a grass area with seeds of some small rapid-growing trees, allow them to grow and shade out the grass, then cut and burn the wood, and plant their crops. The cogon grass is so coarse that it can not be considered a good forage crop unless it is kept closely cropped, in which case other grasses better for forage gain a foothold.

SECOND-GROWTH FORESTS.

The 20,000 square miles of second-growth forests in the Islands, like the grass lands, are due in the main to the *cañgin* system of agriculture. If fires are not started when the *cañgin* is abandoned, the woody species quickly gain the ascendancy and shade out the little grass that has obtained a foothold. Here, as in temperate regions, certain species of little value enter the freshly deforested regions, giving rise to subtypes of forest known under the Tagalog name of "*calaanan*," the Visayan name of "*late*," and the Moro name of "*boog*." On freshly exposed soil, the first stages of this reforestation process are remarkably similar throughout the Islands. At first, the composition is very simple, being made up principally of the following species: *hamindang* (*Macaranga bicolor*), *binunga* (*Macaranga tanarius*), *hinlaumo* (*Mallotus ricinoides*), *alim* (*Mallotus molluccanus*), and *balanti* (*Homalanthus populaneus*), all belonging to the *Euphorbiaceae*; *anabion* (*Trema amboinensis*), belonging to the

Ulmaceae; and anilao (*Columbia serratifolia*), belonging to the *Tiliaceae*. For small areas, sometimes one, sometimes another, of these trees are found in almost pure stands. This is particularly true of hamindang, binunga, anabion, and balanti. All these trees are capable of producing seeds within a year or two after germination. Some are edible, and are thus quickly scattered by birds and animals; others have fruits adapted to wind distribution. Most of them mature early, are light loving, and are replaced by a more complex stand, composed of shade-enduring species. Ultimately, these second-growth forests may redevelop into forests whose composition is much like that originally destroyed.

In the natural reforestation of the grass lands, another set of species first gains entrance. In the high regions of central and northern Luzon, the Benguet pine (*pinus insularis*) is the pioneer species. In the lowlands among those that first gain entrance are binayuyu (*Antidesma ghaesembilla*), alibangbang (*Bauhinia malabarica*), duhat (*Eugenia jambolana*), acleng-parang (*Albizia procera*), and others. The first two of these are especially able to resist the effect of fires, and thus can occur as scattered trees through the grass lands. When the fires are checked for several years, these trees often form the centers for closed stands, and eventually cover large areas. These subtypes become gradually more and more complex, the rapidity of the process depending on their distance from seed-bearing trees, and of course the composition varies according to the character of the species of the seed-bearing centers. Thus so many subtypes exist that it is difficult to make generalizations. Advance stages in the development of second-growth forests are so mixed with tangles of climbing bamboo and other vines that they are difficult to penetrate. Such forests often cover large areas, and are the so-called jungle growths of the Philippines. They often alternate with patches of grass, with which they make the vegetation known as parang. Forest fires such as exist in drier portions of the tropics and in temperate regions do not exist in the Philippines. Surface fires run through the pine forests, destroying young trees and injuring somewhat the older ones. Outside the pine regions there are practically no forest fires, only "prairie" fires and burnings of timber that has been felled previously. These may injure the edge of the original forests, but do not penetrate them and produce conflagrations such as are known in the coniferous forests of the temperate regions. The parang districts often show kaleidoscopic changes, due to the rapid development of jungle growth where the fires are checked and to the entrance of grass or second-growth forests in newly abandoned cañings. In the more thickly settled portions of the Islands, and along well-traveled trails, practically all the original forests have disappeared, giving place to grass or second-growth forests. The second-growth forests are seen by the average traveler, and have conveyed the wholly wrong impression that the forests of the Philippines, and, it is believed, of the tropics in general, are a densely overgrown mass of impenetrable jungle. Little is seen of the original forests of the interior, for the jungle growth on its borders tends to discourage efforts to penetrate within. Over one-half (approximately 68,000 square miles) of the area of the Islands is covered with grass or with second-growth forests. The prevention of further destruction of the virgin forest, and the reforestation of the grassy regions on non-agricultural lands, both by the prevention of fires and by planting, are the greatest forestry problems of the Philippine Islands.

VIRGIN FORESTS.

Virgin forests are those which either have been undisturbed by man, or have been so little exploited that their original character has not been materially changed. They form the source from which the inhabitants of the Islands may draw and are drawing their main supplies of timber, and also include the protective forests of the high mountain regions. They cover approximately one-third of the total area of the Islands.

CLIMATE.

The average annual rainfall of the Philippines shows pronounced variations in different parts of the Archipelago, ranging from 900 millimeters (36 inches) to 4,000 millimeters (160 inches). The heaviest rains occur during the summer and autumn months (June to October), which is properly called the rainy season. The entire Islands are well watered during these months. During the winter months (November, December, January and February) the northeast monsoon rains continue to water abundantly the eastern and northern coasts, thus giving the Pacific coasts and the islands bordering the large inland seas a prolonged or second rainy season. The western half of central and northern Luzon, the western coasts of Mindoro and Panay, the Calamianes group, and small areas in other portions of the Islands receive little rainfall from this monsoon, because of intervening mountain masses. Thus a prolonged, comparatively dry season with only occasional showers prevails in these regions for the six months from November to May. In the other portions of the Islands, this dry season varies from two to four months and is more frequently interspersed with showers. In some places the showers are so frequent that there is an entire absence of a dry season. Thus it will be seen that there are two distinct climates, one in which the dry season is long and pronounced and another in which the dry season is shorter and less pronounced and sometimes wanting. In the former region, the forests during this season shed a portion of their leaves, and some trees are even entirely defoliated for a short time; in the latter, the forests are generally evergreen. Though grass areas are found in both, they more quickly establish themselves in the drier belt. It is a general rule that throughout the Islands during the long or short dry seasons the amount of rainfall in local showers, and the relative humidity, is less in the lowlands than in the high altitudes; consequently, the forests of the low altitudes may show a much less evergreen appearance than the forests of higher altitudes of the adjacent interior mountain passes.

The monthly distribution of the rainfall should be considered, because some localities in the regions of a long dry season receive a greater annual rainfall than others in the region of a short dry season. Thus Balanga (Bataan), in the region of the long dry season, has an annual rainfall of 2,394 millimeters, of which 83.5 per cent falls from June to October; 5.3 per cent from November to February; and 11.2 per cent from March to May. On the other hand, Jolo, in the Sulu Archipelago, with no dry season at all, has an annual rainfall of only 1,666.8 millimeters, of which 49.2 per cent falls from June to October; 28.3 per cent from November to February; and 22.5 per cent from March to May.

Although the Philippines have a range of latitude from 4.5° to 22° north, the variation in the temperature is believed not to be great enough to have any pronounced direct effect on the vegetation below 500 to 600 meters in altitude.

TOPOGRAPHY AND SOIL.

As a general rule, the topography of the Islands of the Archipelago consists of interior mountain ranges, with coastal plains of greater or less width. In some cases these ranges are nearer one side of the Islands than the other; in others, large river valleys separate two parallel mountain ranges. The mountains are volcanic in origin. Some isolated volcanic peaks rise abruptly from the surrounding lowlands. Limestone deposits, often crystallized by volcanic action, occur scattered throughout the Islands, especially along the coast. In some portions, large areas of stratified volcanic tuffs exist. These variations in the character of the rock and soils in a measure affect the character of the vegetation. Under a discussion of the forest types, attention will be called to certain pronounced variations due to this cause.

The subject of cattle raising in the Philippines is very well handled and exhaustively treated in the special brief report appearing as Appendix V. While this deals mostly with cattle raising, the production of other classes of live stock depends so much upon the same conditions that this report is of especial interest, not only to prospective cattle raisers, but to any one considering any phase of the live-stock business in the Philippines.

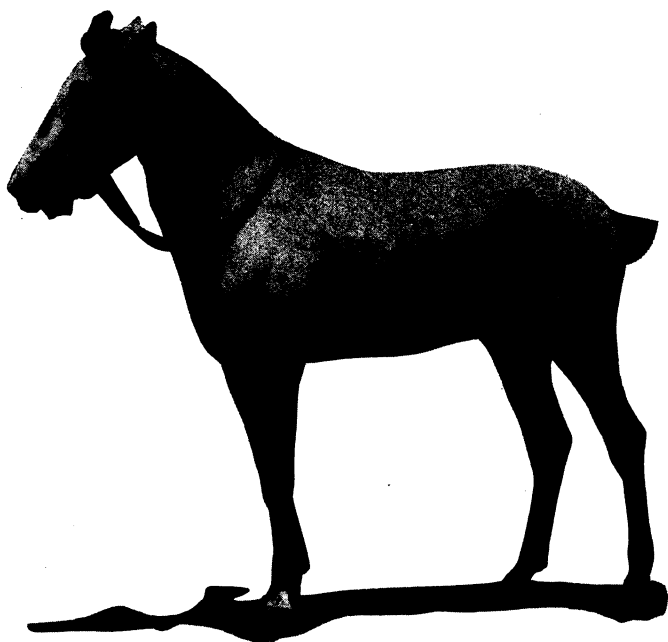
The rainfall map appearing as Plate VII shows the amount and distribution of the rainfall in the different parts of the country.

HORSES.¹

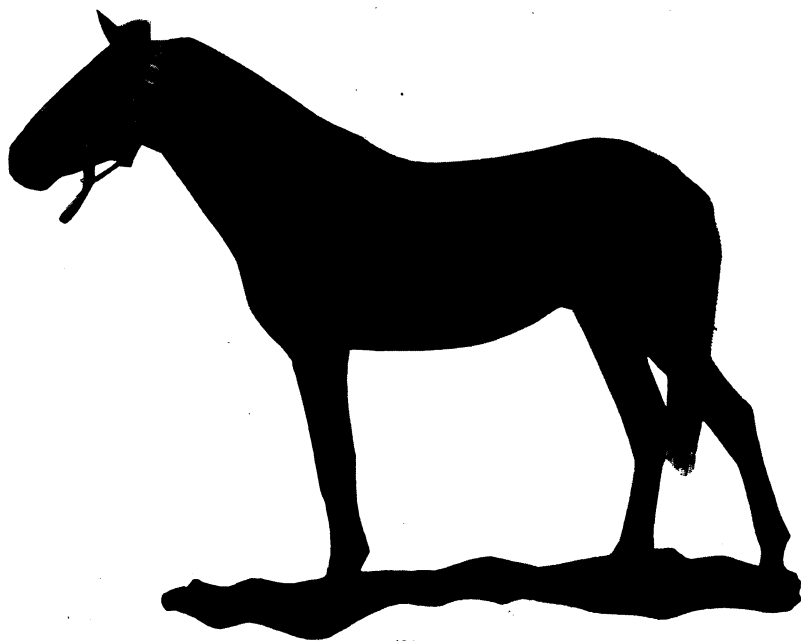
The present-day horse of the Philippine Islands is largely the result of the blending of the blood of the Sulu horse with that of the horses brought into the northern islands by the Spaniards, together with some admixture of Chinese blood. So intimately have these different elements been blended that it is only in occasional individuals that the character of the original stocks can still be traced.

Of these elements the first to be introduced was the Sulu, which was brought into the Sulu Islands from Sumatra, Borneo, and Malakka by the Moros during the middle of the fifteenth century. The ancestry of the Sulu horse is not definitely known, but geological evidence makes it seem probable that the Sulu is an offshoot of one of the East Indian horses, probably of *Equus sivalensis*, a prehistoric horse whose remains are often found in geological formations of the Pliocene period of India. This prehistoric animal was characterized by a preorbital depression, a large development of the first premolars of the upper jaw, and the presence of but seventeen pairs of ribs. These same characters are occasionally found cropping out in the modern Sulu horse,

¹ Valuable notes on the origin of the Philippine horse have been furnished by Mr. D. V. Mackie, agricultural inspector, Bureau of Agriculture.



(a)



(b)

PLATE II.—(a) NATIVE STALLION. (b) CROSSBRED COLT. (By Arab sire from native dam. Property of the Bureau of Agriculture.)

though developed to a lesser degree than in the ancestor mentioned. Tracing the ancestry still further back, we find that in the ancient Hipparion the premolars reached their maximum development, and that the preorbital depression is functional, probably containing a scent gland such as is found in the stag. Thus we see appearing in the anatomy of the present horse, by monstrosity, structures which normally existed in the ancestral type.

Some paleontologists believe that the Indian species (*E. sivalensis* and *nomadicus*) became extinct, and that *E. stenonis* gave rise, through *E. robustus*, to the modern breeds. But the presence in the Java, Sulu, and Borneo horses of the above-mentioned vestiges of the preorbital depression and the large premolars, make it appear that some modified descendants of *E. sivalensis* survived, and that that species was the lineal descendant of the Hipparion. Such changes in the dentition as have been referred to could easily have been caused by a change of food supply and environment; *i. e.*, in the forest-inhabiting horses that browsed rather than grazed it would be very natural that these teeth should be larger and more powerful.

The horses found in the northern part of the Archipelago are largely descendants of the horses brought into the Islands by the Spaniards. Most of these imported horses were obtained from Mexico, where they were known as creoles, or mustangs. The greater number of them were recruited from the herds that had existed in a semiwild state in Mexico and the adjacent territory from the time they were introduced into the New World by the early Spanish explorers. These creoles, or mustangs, sprang from the Andalusian horse of southern Spain, which had been liberally mixed with the Germanic race. The foundation stock of the Andalusian horse consisted largely of the Arab and Moor horses left by the Moors upon their expulsion from Spain, and individual animals brought back to Spain by returning crusaders. The exact place of origin of these Arab and Moorish horses is not definitely known, though it is a fact that they were bred pure for over 2,000 years. Some writers contend that the Valley of the Nile was the original home of the breed, but as no Egyptian paintings prior to the invasion of that country by the Hyksos (1700 B. C.) exist, it seems safe to state that the horses were first taken to Egypt by them.

Some authorities hold that the high-caste Arab is akin to the Celtic pony, claiming that the only fundamental difference between the two races, excepting the pelage, is in the ears, which in the Arab are full and incurved at the points.

This Arab stock was freely crossed with Germanic blood, in

order to secure an animal of sufficient weight to carry the heavy armor that was worn at that time by both horse and rider. The history of this crossing of the Spanish horse and its change of racial characteristics may be studied from the fifteenth century paintings of Rizze, Bartolomi, Gonzales, Paret, and Goya in the Museum of Paintings at Madrid. The horses in the paintings of Goya, in such pictures as those of the Duke of Zaragoza and of Charles IV, appear with oval, sheep-like heads. The paintings made during the middle of the eighteenth century also show that the typical Andalusian horse strongly resembled the Germanic stock. It is very probable that Charles V of Germany, who was also King of Spain, had much to do with the introducing of the Germanic stock into Spain. From the above, it will be seen that the Spanish horse had lost much of its pure Barb and Arab blood before its introduction into the Americas, and that the resulting creole horses were of multiple origin.

The Germanic stock used for crossing with the Andalusian horse contained a goodly amount of blood of what is known as the Norse horse. Most of the individuals of the latter race were dun colored with black mane, tail, and feet; the mane was long and heavy and fell to both sides of the neck; there was a dark dorsal, longitudinal stripe connecting the mane with the tail, accompanied by indistinct shorter stripes; distinct bars on the legs especially in the region of the knees and hocks, were generally present; the ears were short and carried in an upright position, and the outline of the face was convex near the muzzle, ending in a somewhat long upper lip. These characteristics of the old Norse horse are sometimes seen cropping out in existing horses of the Philippines. The old German race, which was much younger than the Arab and Barb, and had not been subjected to such rigid selection, was thus a potent factor contributing to the early degeneration and reversion of our native horses to a type resembling their wild ancestors. In the Arab branch, the dun color, so common among Philippine horses, was never present, for during 2,000 years all horses of dun and cream colors were considered worthless and generally killed. Animals of either of these colors were regarded by the Arabs as unfit for anyone but an "infidel" to ride, and hence, by the long-continued practice of destroying such animals, these colors were gradually eliminated.

In addition to the Sulu and Spanish blood used in the formation of the Philippine horse, it is likely that Chinese horses were among the first introduced, and were brought in at different intervals later, though records of such importations are very incomplete.

The different strains entering into the Philippine horse have been so persistently crossed that it is in only a comparatively few individuals that the original distinguishing characteristics can be discerned. The horses of the Sulu Islands, which were much less affected by Spanish importations than those of the northern provinces, retain more of the original ancestral characteristics. They appear slightly coarser in build, with a longer and more massive head and less style, action, and vigor, than the northern stock. In a few individuals the slight preorbital depression, the large first premolars of the upper jaw, and seventeen pairs of ribs occasionally persist.

All evidence seems to point to the fact that the Philippine horse is a rather composite animal, embodying many of the original strains that have been foundation material for several other better known breeds. The native horse has been bred for a sufficient length of time, without addition of outside blood, that they may be said, in the true sense of the word, to be a true breed. While individual variations occur, there are many breed characteristics that are very constant. Probably no other horse in the world has the combined quality of style, action, vigor, and endurance to the degree that this breed has. "Wonderful pieces of horse flesh," is the common expression concerning them. Their endurance can not be realized by one not acquainted with them. A 48-inch horse will carry a 200-pound man 50 miles over a trail or road in ten hours, without suffering, and he can be hitched to a two-wheeled rig and driven the same distance the next day with three men riding, if the roads are fair. It has been a question of the survival of the fittest for decades, with practically no attention being given to their breeding, and to their welfare during life. This has been undoubtedly conducive to stamina and vigor, but it is surprising that the conformation has improved and the size has not been sacrificed to a greater extent. The males are never castrated, and the females are allowed to breed at will regardless of age or season.

The individuals of the breed vary in size from 47 to 54 inches, averaging between 49 and 50 inches. Only about 10 per cent are 50 inches or more and about 2 per cent reach the height of 52 inches. Occasionally individuals are found standing 53 and 54 inches, but these heights are rare. The colors are mainly bay, black, gray, and dun, appearing in frequency in the order named. Very rarely is white found mixed with the other colors, even on the legs and face.

In general appearance they are clean-limbed, smooth of body, and rather upstanding. The head is broad, the face straight, and the ears small and fine. The neck is usually of good length,

small at the throat-latch, noticeably thick through the lower portion, the upper line usually arched, and joined forward and low at the withers, causing in nearly all cases either a depression at the juncture or a comparatively straight line over withers and adjoining portion of the neck. This manner in which the neck joins the body is one of the noticeable characteristics of the breed, tends to give the body a long appearance by lengthening the body top line, and causes the neck often to appear short. The back is usually straight and rather narrow; the loin straight, heavy and broad and well joined to the croup. The croup is often short, drooping and narrow and the tail set low. The body is long, but rather inclined to be narrow and shallow. The feet are of excellent quality, large, well open at the heels and usually "set straight." The fore limbs below the knees are set well in line, are clean, hard, "non-meaty," and with the proper length and slope of pasterns. Often a slight narrowness is in evidence just below the knees, which are large and strong. The forearm is inclined to be small though the arm is sufficiently large and the muscles well developed. The shoulders are large, sloping and well laid to the body, being very well laid in at the top. The posterior limbs are often light and long in the gaskins, "sickle" and "cow-hocked" and often back of the proper position. While the poor hindquarters and withers are constant enough to be breed characters, there are many individuals excellent in one or more of these points, and often individuals are met with the conformation of which leaves little to be desired.

One of the important characteristics of the breed is the universally excellent quality of limbs and feet. Bone affections, such as spavins and ringbones, are seen so seldom that they may be considered almost a negligible quantity. Less than one-tenth of 1 per cent are thus affected. The writer has never seen or heard of a native horse affected with side bones. This absence of limb affections is all the more interesting when it is considered that the horses here are put to much greater strains and more constant, hard, predisposing usage than are the average horses of European and American countries. They are usually ridden and driven from the time they are two years old, and often at a much younger age. In the official races run monthly in Manila the horses are weighted from 100 to 140 pounds. Many run races each month and are in constant training for upwards of six or seven years and leave the track sound. The greater percentage of those that do "break down" or have to be "laid up for a spell" suffer from "tendons." The percentage of native horses working on the streets of Manila that are over 20 years old is probably greater than in any other city of the world.

Considering the weight that they are compelled to carry, and the conditions of the track, the official records made by the native horses on the Manila race track are little short of marvelous. Some of these records are here given:

Records of horses which have run at the San Lazaro race track.

Date.	Owner.	Horse.	Distance.	Time.	Weight.	Jockey.
			<i>Miles.</i>	<i>Minutes.</i>	<i>Pounds.</i>	
Apr. 3, 1904	S. Ortiga	Orlando	$\frac{1}{2}$	1.48 $\frac{1}{2}$	143	Ruiz.
June 11, 1904	do	do	$\frac{1}{2}$	3.16 $\frac{1}{2}$	130	Do.
June 12, 1904	F. Herrero	Agusan	$\frac{1}{2}$	2.04 $\frac{1}{2}$	90	Manuel.
Do	do	Umpara	$\frac{1}{2}$	2.23 $\frac{1}{2}$	116	Vasallos.
Apr. 14, 1906	do	do	$\frac{1}{2}$	1.14 $\frac{1}{2}$	124	Ruiz.
Do	do	Sagunto	$\frac{1}{2}$	1.31 $\frac{1}{2}$	121	Felipe.
Do	R. Asunción.	Lapulapu	$\frac{1}{2}$	1.39 $\frac{1}{2}$		
Feb. 11, 1907	M. Cortes	Perla	$\frac{1}{2}$	1.07	110	Cortes.
Feb. 22, 1909	do	do	$\frac{1}{2}$	5.09	124	Do.
Do	J. Flameño	Buster	$\frac{1}{2}$	0.58 $\frac{1}{2}$		
Mar. 26, 1910	F. Herrero	Umpara	$\frac{1}{2}$	2.40	119	Tolentino.

*Approximately.

At present horses are used here principally for riding and light driving. Practically no heavy draft work or field labor is performed by them, cattle and carabaos being used for the heavy work. Some packing is done with horses in sections of the country where cart trails or roads do not exist. It is doubtful if the horse will be used for field work, to any extent, during the next half century. They will take the place of cattle and carabaos as draft animals on the roads to a great extent, providing the numbers increase and more large individuals are available.

It is chiefly because the larger native ponies are so difficult to obtain and command so high a price that Australian horses are imported. For most purposes large native horses are considered superior to the Australian, as they wear longer, cost less to keep, are less liable to go lame and are handled better by the Filipino drivers.

Large native horses with good conformation, and evidencing indications of developing speed, are often sold for use on the Manila race track at from ₱1,000 to ₱2,500. A 52-inch horse, well broken to drive and with a goodly amount of speed when hitched, will always be purchased quickly in the larger towns, for driving purposes, at from ₱300 to ₱800, speed and style being the prime requisites. Fair driving animals, 50 to 52 inches, are sold on an average of about ₱200, ordinary ones 49 to 50 inches selling at from ₱80 to ₱150. Prices depend considerably on whether the horses are purchased in the country or after they are in town. Ordinary mares usually sell cheaper than males of the same class. Average specimens can be purchased in the provinces at from ₱50 to ₱125. Exceptionally good mares,

standing 50 inches or better, are much higher and are difficult to obtain at from ₱200 to ₱300. Mestizo colts are much prized by the people and sell readily at from ₱400 to ₱1,000.

It is a deplorable fact that the native horse has deteriorated during the last fifteen years. The reasons and remedies are obvious, but unfortunately this knowledge will have but little effect in the near future toward checking the deterioration of the breed as a whole.

Before surra became prevalent in the Islands, horses were so plentiful in the country districts that many good stallions were left with the mares. During the last few years horses have become so high priced and scarce that all the best ponies are taken up for use before the breeding age. After a male is once taken up and put to work he rarely ever is given the chance to breed. After he becomes old and unfit for work, he is usually slaughtered for meat, or, if he is returned to the country, he is generally found to be impotent. Thus at the present time only the most inferior males are with the mares, and it is by these that the present day foals are sired. The castration of all small and otherwise inferior males, and the placing of a few good stallions in each municipality for free public service, would work wonders in the improvement of the breed. However, the prejudice against castration is so strong among the people that it is impossible to castrate more than a very small percentage of those that should not be serving mares.

The Bureau of Agriculture is, and has been maintaining American, Arabian, and large native stallions in the provinces for free public service. By this means a good many fine cross-bred colts are annually foaled, but the males are usually removed to the cities before they have an opportunity to breed and thus only the mares are left to continue the work of improvement. The Bureau has found it very difficult to secure desirable horses for this provincial breeding work and is now raising its own supply. Native mares are bred to Arabian stallions, and American and native mares to Arabian and native stallions; from these crosses are being obtained some fine stallions of the proper size and conformation for the purpose desired. Some of these are sold each year and are eagerly sought for by people who desire good stallions, but who do not care to risk ordering them from foreign countries, and who also realize that those raised here are in many ways superior.

The importance of improving the native horse by selection can not be overestimated. The Bureau is doing some important work along this line. The largest and best native mares ob-

tainable are being crossed with large native stallions of good conformation, the mares being between 51 and 52 inches in height and the stallions 54 inches. It is believed that with good care offspring of the first cross will average 53 inches; and in five or six generations a strain should be developed, many of the individuals of which will measure 56 inches in height. Though it is realized that it will take longer to increase the size of the breed by mere selection than it will by the introduction of outside blood, there is no question but that the strain produced by breeding the native horse pure, if the size can be increased sufficiently, will be in most ways vastly superior to those built up by out-crosses of foreign blood. It is quite safe to say that if 56-inch native horses ever become easily available here the importations of horses will drop 90 per cent.

No breed of horses has yet been imported in the Philippine Islands that will thrive on the feed, care, and work given the native horse by the people. The people may be educated in time to take better care of their live stock, but from present indications it will be a slow process. Then also if a native horse can be produced at less cost than one of foreign blood, or a grade, and will command as much money at maturity, where is the advantage of using the outside blood? Notwithstanding what may be said to the contrary, the Bureau has had ample proof that cross-bred horses can not be reared as cheaply, or under the same conditions as the pure native horse.

In spite of what has been said above regarding the pure native horse, people contemplating going into horse breeding at the present time are advised to use foreign males, as their mares will necessarily be small, and there is at present no strain of large native horses the individuals of which will breed even approximately true to size. The extra care that the cross-bred colts will require over that necessary for pure native stock will be more than repaid by the difference in value between the grade colt and the ordinary native animals.

Mule breeding has never been very strongly encouraged by the Bureau, because of the fact that the country needs breeding animals. The Bureau in the past had a few large jacks, and enough mules were produced to prove that the native mare bred to a large jack will produce a very satisfactory mule. With the increase in sugar planting there is sure to be a greater demand for mules, and the breeding of these animals will manifestly be a paying proposition. The present prices of imported stock vary from about ₱325 for the Chinese to ₱600 for the American mules.

CATTLE.

Cattle are found in nearly all parts of the Islands and, like many of the other animals, their origin can be traced back to the advent of the Spaniards and of the Chinese. Naturally then, two distinct types are easily recognized: one in which the Chinese blood seems to predominate, the other in which the principal characteristics indicate their Spanish origin. The former is represented by the red cattle of Luzon and Mindoro and the latter by the black, or black and white cattle of the islands north of Luzon. Those of Chinese origin are more widely distributed than those from Spanish stock. Among these Chinese cattle are two types: those of Mindoro, which are upstanding, rangy, and thin throughout the body, and those of central and southern Luzon, which have a more compact, symmetrical body placed upon well-set, short legs. These cattle are well adapted to the country, and are seemingly better rustlers than are those of Spanish origin, which are found generally distributed in northern Luzon and in the islands to the north.

The larger individuals of the native type make good work animals and many of them are used for that purpose. The remainder of the total number of cattle in the Philippines is composed, with the exception of a few pure-bred animals, of work bullocks imported from China and Indo China. About 4,000 of these are distributed throughout the various provinces annually.

There are in the Philippines very few herds that receive more than the most meager attention. In Mindanao, Mindoro, Leyte, Batan Islands, Babuyan Islands, and Marinduque a few large droves exist. About 90 per cent of the cattle are found in herds of 50 or less, 8 per cent in herds of 500 or under, and 2 per cent in herds of 2,000 or more. The larger groups, as a rule, contain nearly as many scrub bulls as females, due to the fact that castration is not usually practiced and the different classes are never separated, consequently the average herd presents a sorry spectacle. The cattle of these large herds are very wild, and as they are never worked, and as no fences are used, it is a difficult undertaking to capture them for shipment to market.

The cattle produced in these large groups are in most cases the smallest in the Islands and are used principally for beef. The animals used for draft purposes are usually produced by people having only a very few cows. These cows in most cases show evidence of a goodly amount of Chinese blood. The better bullocks of this class weigh from 600 to 800 pounds, and sell at from ₱80 to ₱120 each. The cattle from the larger herds are



(a)



(b)



(c)



(d)

PLATE III.—(a) NATIVE BULL. (Chinese blood predominating.) (b) NATIVE BULL. (Spanish blood predominating.) (c) IMPORTED CHINESE BULLOCK. (d) CROSSBRED BULL. (Galloway-native.)

usually quite light, weighing only about 450 pounds and sell for meat at about ₱50 each. The reason for the small size of these cattle is not lack of feed, but the fact that no fresh blood has been introduced in most of the herds during the last fifteen years. The practice of allowing all the males to remain entire and run with the cows and calves is not only responsible for the present small size of the individuals, but is also responsible for the death of many heifers and new-born calves. Contrary to what might be expected, the inbreeding and degeneracy has not resulted in sterility. Native cows are very prolific, and the calves are strong, and if not killed by the bulls, usually live.

The price of fresh beef in Manila averages about 17 centavos ($8\frac{1}{2}$ cents gold) per pound, when purchased by the quarter or carcass. In other parts of the Islands, where imported cattle do not compete, the price is usually higher.

There are at present about 248,398 cattle in the country. (See Appendix I.) Probably not more than 100,000 of these are females.

A number of breeds of cattle have been imported by the Bureau of Agriculture from time to time, and various experiments have been conducted with a view to improving the native stock. American Herefords, Shorthorns, and Jerseys were first introduced; sufficient experiments were conducted to prove that these pure-bred European cattle will not survive under present range conditions. The experience of all importers of pure-bred American or Australian cattle confirms this conclusion. On the other hand, a number of breeds have proven very valuable as a factor in upgrading the native stock by the infusion of foreign pure blood. Among these, Angus and Galloways, when crossed upon native and Chinese cows, produced "mestizos" which have proved very satisfactory. These grades are, as a rule, hornless and much larger than the cows; are generally solid black in color, possess much better beef conformation, and seem to be as good rustlers as the common stock. To what extent this upgrading can be carried on and still retain the last mentioned quality has not, as yet, been determined. We would expect the Galloway grades to be slightly better rustlers than the Angus crosses, but on the other hand, they have longer hair and are consequently troubled more by the ticks. Shorthorn and Hereford grades have not yet been sufficiently tested to warrant any conclusion regarding them.

Nellore cattle were introduced by the Bureau in 1909. They have been successfully raised, pure, at Alabang and La Carlota. At Baguio they do not seem to thrive as well as in the lowlands, owing, perhaps, to the cold rains.

A number of pure breeds and grades of this breed have been sold by the Bureau, and most of these have given very good satisfaction as work animals, owing to their size and general energetic disposition. Nellore bulls have been crossed upon Chinese and native dams with very gratifying results. The resulting grades are of good size and conformation, and seem to be able to subsist on the natural pastures of the Islands. The fact that these Nellore cattle are seldom troubled by ticks, that they are very resistant to rinderpest, and that this resistance is transmitted to their offspring, should be important factors in recommending them for this country.

The problem of securing fresh dairy products is a very important one to those living in the tropics. Practically the only dairies in the Archipelago are found in Manila and here there are no extensive plants. The supply of dairy products does not begin to meet the general demand. The dairy cattle consist of grade Shorthorns and grade Ayrshires. Dairying is one of the most promising industries in the Philippines, and it seems strange that more people have not entered this field of investment. At present fresh milk is selling in Manila for 20 centavos per *chupa*,¹ or 53 centavos per liter.

Two breeds of tropical cattle which should prove profitable for the Philippine dairies are the Montgomery and the Sind. The former, known as Sohwal or Teli breed, are found in Ganji Bar in the Montgomery district. They are considered to be the best milch cattle of India, good animals giving 30 pounds daily. In color they are red, pure white, gray, or spotted. They are medium-sized, shapely, short-legged, have short horns and clean-cut heads. The Sind or Husi cattle are second only to the Montgomerys in point of value as dairy cattle in India. They are red, with occasional white color-markings, of medium size, with long deep bodies, short legs and long level quarters. Average cows of this breed give 20 pounds of milk daily.

These two Indian breeds of milch cattle are raised by nomad tribes, who give them the best of care, feed them well, and practice selection, keeping only the best bulls for breeding purposes. Specimens of this breed may be purchased through the director general of Agriculture of India at Poona. On the Indian market a cow sells for from ₱40 to ₱75.

In no other country in the world are so great opportunities offered for beef-cattle raising as in the Philippines. There are any number of isolated tracts of land, well watered and with an abundance of pasturage, that may be purchased or

¹ 375 cubic centimeters.



PLATE IV.—IMPORTED NELLORE COW.
(Property of the Bureau of Agriculture.)

leased at reasonable rates. Each year there are imported into the Islands more than 40,000 head of beef cattle, also P5,184,519 worth of canned and cold storage beef. The most rational method of laying the foundation of a herd of beef cattle is to cross native, Chinese, or Indo-Chinese cows with imported bulls of some of the recognized beef breeds, such as Hereford, Galloway, Angus, or Nellore. For the beef-raising industry the stockman must have cattle that will subsist upon the native pastures. The red cattle which come from Hongkong are better adapted to the conditions here than are the native cattle themselves. They are of good beef conformation, compact and symmetrical, the only objection to them being their lack of size. If a sufficient supply of cows of this type could be secured they would undoubtedly prove good animals to use for a foundation herd.

Appendix V takes up the question of beef production in an exhaustive manner. The reader's attention is invited to this report.

CARABAOS.

The carabao is the most important domestic animal in the Philippines. Upon these animals the agriculture of the Islands is largely dependant, probably more than 90 per cent of the draft work, of all kinds, being performed by them. They are used in preparing the land for planting, in cultivation, and in transporting the crops to market. The carabao cart is the only conveyance for thousands of families. The milk, which is of good quality, is used by the Filipinos practically to the exclusion of all other kinds. After their usefulness as draft animals has passed they are slaughtered, the meat used for food, and the hides made into leather.

There are in the Islands more than 713,121 carabaos. (See Appendix I.) The numbers are increasing, but not in proportion to the demand. About 10,000 are imported annually from Indo-China.

A good many cattle are used, especially for road work and for sugar-cane cultivation. That the carabaos are inferior to cattle, for most lines of work, is the opinion of many. However, the prejudice in favor of the carabao is so strong with the laboring class, that they usually prefer these animals. The carabao is treated better and given more attention than any other class of domestic animals in the Islands.

The great advantage that the carabao has over the other draft animals is his ability to work easily in mud, where cattle would be of little value and a horse would be useless. This trait is of

great importance in this country, as most of the rice is planted in paddies during the rainy season, and the land is prepared in a semiliquid state. For this work the carabao is the only animal in existence that is at all satisfactory. The greater strength of the carabao enables him to haul larger loads than would be possible with cattle—an important advantage, as both cattle and carabaos are usually worked singly with a man in charge of each animal.

In the absence of mud, carabaos are inferior to cattle as draft animals; they are much slower, are unable to work as long at a time, can not perform labor in the sun as well, are more susceptible to disease and do not increase as rapidly.

The native carabaos are much the same in all parts of the country and are all draft animals, there being no milking strains among them, as in India. The local animal is smaller than those imported from Indo China, but is superior for work purposes, being hardier, stronger and more willing.

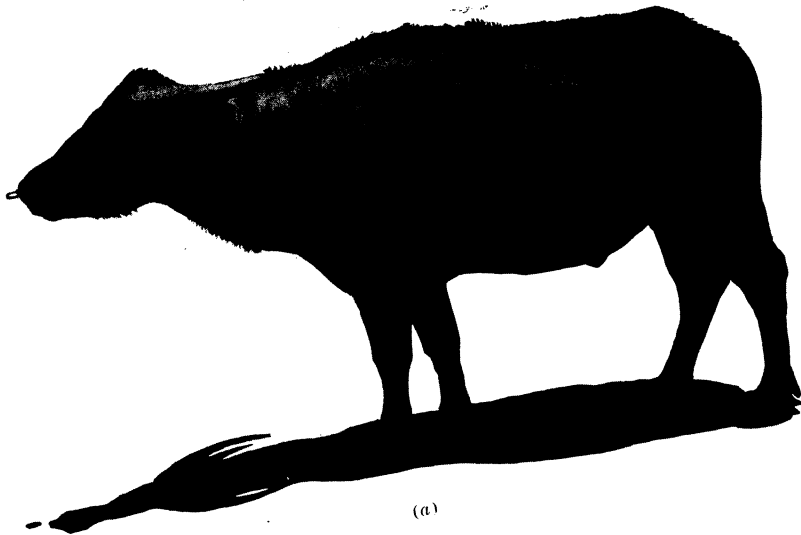
Prices vary greatly; conformation, disposition, strength and willingness to work are the determining factors. For good, mature, but young animals ₱125 is probably an average price. However, many sell for from ₱135 to ₱200 each.

Though carabaos do not breed as rapidly as cattle, the period of gestation being longer and the dam usually not breeding until the calf is weaned, still they increase rapidly with but little mortality among the calves. As with other classes of stock, no care is given to the breeding or the improvement of these important animals by most of the people raising them. Though the Philippine carabaos will compare favorably with those of other countries, much could be done toward their improvement by selection.

Appendix IV is an interesting article by David G. Fairchild on "Breeds of Milch Cattle and Carabaos for the Philippine Islands," and should be read by those interested in the subject of dairies.

SWINE.

In point of numbers swine hold first place in the Philippines. There are over 2,000,000 scattered throughout all parts of the country. (See Appendix I.) They are the scavengers of the country, due to the fact that they are seldom if ever confined and are compelled to forage for most of their feed. No one person keeps any considerable number, usually but one breeding female being kept by a family. The great majority of the population of the Islands are dependent upon the pig for their meat supply.



(a)



(b)

PLATE V.—(a) NATIVE CARABAO. (b) IMPORTED INDO-CHINESE CARABAO.

There is always a good market in all parts of the country, both for local consumption and for shipment to the larger towns. Mature animals sell for about 25 centavos per kilo, live weight, and dressed carcasses bring in Manila from 30 to 40 centavos per kilo. Many pigs weighing from 10 to 50 kilos are slaughtered as "lechones." These are stuffed and roasted whole over an open fire. Pigs for this purpose bring excellent prices.

The importation of swine products amounts to over ₱1,000,000 per year (see Appendix I), all of which products could easily be produced locally.

The Philippines offer exceptional inducements for the production of swine and for the manufacturing of swine products. Roots and forage suitable for swine feeding can be grown very easily and with comparatively little cost.

Native swine are wonderfully hardy and prolific; the average number of pigs to a litter is larger than in the case of improved breeds; the pigs are usually very strong and the percentage that live is high; the sows are good mothers, rearing large litters well on very little feed.

The conformation of the native pig is very poor—they are long-nosed, narrow-bodied and flat-sided; however, they respond well to feeding, and may be finished into fairly good killing shape.

The Bureau has for several years been raising and distributing pure-bred Berkshire swine for crossing on those of the native breed. The pigs obtained from this cross are exceedingly satisfactory, strongly favoring the Berkshire parent in conformation and hardiness, and showing but little diminishment of the rustling qualities inherited from the native pig. The Berkshire characters persist for a surprising number of generations of crossing with the pure native stock.

GOATS.

The total number of goats in the Archipelago is estimated at 407,087. (For number by provinces see Appendix I.) They are much more generally distributed than are sheep, nearly every barrio, in fact, claiming at least a small flock. As is the case with most of the native animals, almost no care is given them; they are allowed to roam about the barrio, and increase year by year by natural selection, as few males are ever castrated. No particular breeds or uniform types are represented among these bands, which present specimens varying widely in color and conformation. But in spite of these conditions a number of individuals are to be found which in size and conformation are far superior to what one would naturally expect.

The goat can be, and is put to a variety of uses, here as elsewhere. In a few districts the large bucks are used in a limited way for draft purposes, when other draft animals are scarce. The meat, which will compare favorably with mutton, is a very common article of diet in some localities, though in other sections it is only occasionally eaten. The milk of the goat is sometimes used by the Filipinos though not nearly so generally as among other Oriental people, or as it should be among the Filipinos.

Milch goats possess many qualities that should strongly recommend them to the average Filipino farmer. The fact that they are both grazers and browsers, and exceptionally hardy, places them among the most economical domestic animals. There is a sufficient quantity of waste feed in most barrios to enable each farmer to keep a small flock, and the initial cost of breeding stock would be practically his only expense. In many oriental countries and in Europe, where it has proved to be particularly adapted to the needs of the poorer classes, the milch goat takes a prominent place in the live-stock industry. In Germany 75 per cent of the households keep these animals.

The milk of the goat is superior to that of the cow and carabao, and is produced much more economically. It has a higher content of albumin and butter fat, and to it medicinal properties are generally attributed. In proportion to body weight, the yield of milk from the goat is much larger than that from the cow. A mature milch goat will yield from 2 to 5 quarts per day, while many individuals of the Nubian breed give 6 or more.

The breeds of milch goats are as numerous and varied as the climates and localities in which they are found. Spanish and Maltese goats have been introduced by the Bureau of Agriculture, and maintained for some time at the various stations. When given plenty of range they seemed to do very well, but when confined too long in small runs they became infected with parasitic diseases. Maltese bucks can be purchased for from ₱36 to ₱50, and Spanish from ₱20 to ₱40.

Other tropical breeds which should prove suitable to this country are, the Nile or Egyptian, Syrian, Malaga, East Indian, etc. Of these, the Syrian can be purchased for from ₱12 to ₱20.

Angora goats, although they give milk of superior quality, are not particularly noted as dairy animals, but are grown more for their fleece and mutton. To date no attempt has been made to raise this breed of goats anywhere in the Islands, other than in the Province of Benguet, but as they are able to adapt them-

selves to great extremes of temperature, and as they are grown in various tropical countries, it is only reasonable to suppose that they could be grown here very successfully.

When raised upon a commercial basis Angoras prove very profitable. Their flesh is exceedingly delicate and nutritious, resembling that of sheep more nearly than do other breeds. Their fleece, called "mohair," furnishes material for some of the finest ladies' garments and is used in various other manufactured goods. The skins are tanned and used as leather, and the pelts make fine rugs. A well-bred goat shears from 4 to 9 pounds of mohair. The world's mohair market is Bradford, England, where practically the entire product of Turkey is sold. New York City is the principal market for that produced in the United States.

It would seem to be a feasible plan for the Filipino farmers of a barrio to coöperate in the purchase of one or more good bucks of one of the best milch breeds, for the purpose of upgrading their native goats. If properly cared for, a buck will serve fifty does, and the latter will breed twice a year. The bucks should run with the flock only during mating time. To obviate the danger of inbreeding, near-by barrios might exchange bucks from time to time. The young mestizo males should be castrated and sold for meat; the cull does should be disposed of through the same channels, reserving only the best females for breeding stock. If this plan were adopted, each barrio could, within a short time, possess a flock of milch goats nearly equal to pure breds.

In Manila, where there are so few dairy cattle, and fresh milk is so difficult to obtain, goat dairies should be a paying proposition.

Native females can be purchased at from ₱3 to ₱5 each, depending on size, and whether pregnant or not. The Bureau of Agriculture furnishes pure-bred Maltese or Spanish males at ₱20 each, and grades of the same breeds at ₱10 each.

SHEEP.

Sheep are not found to any great extent in the Philippine Islands, the total number according to recent data being 88,760. There are no large ranches, and nowhere is the industry conducted on a commercial basis, though in nearly every municipality a few native sheep are to be found running at large. (For numbers by provinces see Appendix I.)

The native sheep, probably introduced from Spain, are hornless, and of a coarse-wool variety. Owing, however, to the fact that no attention has ever been paid to breeding, or care taken in

the management of the flocks, no pure breeds or uniform types are to be found among them. These sheep are allowed to roam about the barrios at will, no attention being given them, not even shearing. No use whatever is made of them, except that occasionally one is killed for mutton.

Sheep of the Shropshire breed seem to do well in this country, as has been demonstrated by the Bureau of Agriculture. A small flock was successfully maintained for some time at the Trinidad stock farm, which has an altitude of 1,500 meters, also at La Carlota, Occidental Negros, at nearly sea level, and at Alabang, Rizal Province.

Two strictly tropical breeds, both of which might prove valuable in this country, are the Barbados and the Tunis. The former, or woolless sheep, are raised in the West Indies. They are strictly a mutton animal, having no wool, the body being covered with coarse hair. They are hardy, produce an excellent quality of mutton, and are particularly adapted to the tropics. The Tunis (fat-tailed or Barbary sheep) have proven very successful in Africa and parts of South America. They produce a clip of good quality and their mutton is said to compare favorably with that of other breeds.

In certain sections of tropical Australia, South America, and Africa, where conditions are no more favorable than here in the Philippines, sheep raising is an important industry.

Each year there is imported into these Islands ₱151,396.80 worth of mutton, all of which could be produced locally, and an export trade in wool could be built up. There are large tracts of well-watered grazing land, and cheap sheds are all that is necessary in the line of buildings. Parasitic diseases seem to be the only serious sheep affliction at present, and these are not a serious menace, provided the animals are given plenty of range.

In establishing a flock the best course, perhaps, would be to select good healthy native females and cross them with imported rams, and then, by selection and breeding, build up a strain adapted to the tropical environment.

POULTRY.

Although chickens are found very generally distributed throughout the Philippine Islands, poultry raising, on a commercial scale, is nowhere carried on to any considerable extent. The latest available statistics (see Appendix II) place the number of chickens in the Islands at 5,420,981, valued at ₱2,561,764. These are not found in large flocks, but nearly every family is



(a)



(b)

PLATE VI.—(a) NATIVE SHEEP AND GOATS. (b) NATIVE SWINE.

the possessor of a few fowls. Cockfighting is the natural sport of the people and the average Filipino places a higher valuation upon his game bird than upon either hens or eggs, although both of the latter are important articles of diet. Practically no care or attention is given to poultry raising, except for the production of promising game cocks, which are well fed and pampered while the hens are compelled to forage for themselves. The results of these haphazard methods are what might be expected—birds of ill conformation, with tough, poorly-flavored meat, and laying but few and small eggs.

Turkeys, ducks, and geese are not commonly grown in this country. One of the few localities where ducks are raised in large numbers is the town of Pateros, Province of Rizal. Here duck raising is the principal industry of the inhabitants, who have constructed quite a complete system of houses and yards. The eggs are hatched artificially by placing them between bags of heated rice-husks. The many thousands of ducks raised and sold from here each year afford considerable profit to the growers.

Except in Manila and a very few provincial towns, no pure-bred fowls are raised in the Islands. A number of flocks of pure-bred fowls are being grown in Manila, but the work is conducted by most of the breeders only as a hobby or side issue. No extensive plants are to be found. Some eighteen or more breeds and varieties have been, or are being, successfully raised on a small scale. Of these the Leghorns, Plymouth Rocks, Wyandottes and Brahmas seem to be the most popular.

The Philippines present to the poultry raiser many advantages not found in the countries of the temperate zone: an abundance of green feed and grain can be grown at all times, and the temperature is nearly uniform throughout the year. The cost of buildings is much less than in other climates, since there are no cold winters to guard against. All that is necessary is to provide shade and protection against the rains. Owing to the humidity of the atmosphere and the uniformity of the temperature, incubation can be here used more successfully, and with less difficulty, than in temperate climates.

At present, pure-bred fowls, as well as eggs from same, command very fancy prices in Manila, owing to the fact that the demand for breeding stock and settings of eggs from pure-bred birds exceeds the supply. First-class cocks bring from ₱10 to ₱30 each and hens sell for from ₱5 to ₱20. When it is remembered that more than ₱500,000 worth of eggs (see Appendix III) are imported into the Islands annually, and that

selected eggs from native chickens retail for seventy centavos per dozen, there can be little doubt that poultry raising could be made a profitable undertaking. A number of well-drained sites, protected from winds, within or close to Manila, can be purchased or leased at reasonable rates. A sufficient quantity of eggs and breeding stock of any of the popular breeds may be purchased in Manila. Most of the failures have been due to lack of experience rather than to poultry diseases, for the latter are no more prevalent here than in many of the poultry sections of the United States.

One plan of securing foundation stock for a flock to be grown in the Philippines, on a commercial scale, is to secure good healthy native hens and cross them with pure-bred cocks, using the eggs from these hens for the first hatchings, and then disposing of the native hens. The resulting "mestizos" or hybrids, would constitute the laying and breeding flock. Such a plan is less expensive than commencing with all pure-bred stock, and many breeders claim that the "mestizos" are more resistant to disease than the pure breeds. On the other hand, many trials and no little time would undoubtedly be required to produce by this means a bird having either the egg laying ability of the White Leghorn, or the meat conformation of the Plymouth Rock. Also, it is a question whether the "mestizo" would be more resistant to disease than the properly cared for pure-bred bird.

Of course, engaging in the business upon a commercial scale is a very different proposition from keeping a few birds as a hobby or pastime, but there is no good reason why any investor, equipped with capital and experience, could not make poultry raising in the Philippines a profitable business venture.

It is difficult to understand why the average Filipino farmer does not give more attention to poultry raising. In the provinces there is always a ready market for eggs at from 2 to 4 centavos each, and for poultry at from 30 centavos to ₱1. A nipa shed 4 by 8 meters would accommodate fifty chickens, and the entire cost of shed, bamboo fence for runs, basket nests, bamboo feed troughs, etc., would be very nominal, and a small, well-cared-for flock would add materially to the profits of the farmer.

Within the last year there seems to have been a general awakening among many of the residents of Manila to the opportunities in the poultry industry. With the advancement of the Philippines along the various lines of agriculture, poultry raising is bound to become one of the important industries of the country.

APPENDIXES.

Appendix I.

Number of horses, cattle, carabaos, hogs, goats, and sheep in the Philippine Islands by provinces at the beginning of the fiscal year 1911.

[Compiled by the Statistical Division, Bureau of Agriculture.]

Province.	Horses.	Cattle.	Carabaos.	Hogs.	Goats.	Sheep.
Agusan	202	327	801	4,885	373	30
Albay	4,251	1,133	8,191	50,208	12,082	247
Ambos Camarines	495	1,218	12,305	34,527	21,681	1,153
Antique	270	5,532	13,842	28,254	6,326	586
Bataan	194	266	5,895	7,417	1,725	635
Batanes	19	5,358	1	2,560	991	229
Batangas	20,088	33,797	12,689	87,110	10,743	255
Bohol	2,351	8,023	25,384	520,453	4,675	276
Bulacan	2,651	1,342	30,765	59,278	6,674	717
Cagayan	7,008	10,784	29,266	26,162	5,660	2,090
Capiz	1,886	8,908	28,793	43,699	39,987	1,846
Cavite	4,605	3,245	8,672	34,052	1,761	189
Cebu	90,903	11,428	29,839	263,440	49,235	6,198
Ilocos Norte	11,916	6,938	35,532	37,708	12,054	5,996
Ilocos Sur	9,770	13,300	40,889	70,704	25,154	6,040
Iloilo	1,383	8,002	36,666	86,717	24,447	7,808
Isabela	3,734	2,246	21,756	14,822	2,389	1,119
La Laguna	6,409	1,715	12,873	24,303	3,681	204
La Union	1,826	3,703	18,054	18,739	13,988	3,079
Leyte	3,035	7,070	20,645	59,736	13,455	2,162
Mindoro	2,755	13,581	5,211	6,880	1,815	
Misamis	2,787	1,239	5,858	23,077	3,045	1,173
Moro	3,897	15,435	10,263	17,738	4,915	507
Mountain	3,024	14,628	11,393	24,748	4,525	1,787
Nueva Ecija	718	2,998	28,315	57,333	5,428	1,034
Nueva Vizcaya	489	680	4,230	5,366	730	94
Occidental Negros	1,516	10,769	31,384	45,615	25,065	22,032
Oriental Negros	4,660	3,821	11,871	37,136	20,060	3,580
Palawan	197	8,738	4,810	3,028	498	24
Pampanga	2,628	1,389	30,019	49,471	19,010	4,585
Pangasinan	3,779	12,168	68,129	100,310	20,159	2,118
Rizal	1,669	799	12,928	19,369	2,500	185
Samar	1,102	1,249	6,511	25,211	3,693	218
Sorsogon	3,166	5,981	10,544	36,210	7,357	813
Surigao	1,942	524	8,171	24,762	2,508	182
Tarlac	1,012	1,320	28,428	58,961	18,469	7,830
Tayabas	6,214	8,858	18,165	35,815	5,866	91
Zambales	1,133	3,886	12,040	20,800	2,363	1,649
Total	215,674	242,398	713,121	2,066,605	407,087	88,760

NOTE.—It is estimated that about 10 per cent should be added to the above figures, as not all municipalities reported; and it is believed that some of the reports received included only the registered animals.

Appendix II.

Number of chickens, turkeys, ducks, and geese in the Philippine Islands by provinces, 1903.

[From the "Census of the Philippine Islands, 1903."]

Province or comandancia.	Chickens.	Turkeys.	Ducks.	Geese.
Philippine Islands	5,470,981	9,201	78,215	6,202
Abra	35,352	3	179	1
Albay	85,378	69	310	146
Ambos Camarines	130,650	62	681	234
Antique	59,990	17	119	37
Basilan	955	5	20	10
Bataan	27,807	8	229	1
Batangas	195,942	10	154	32
Benguet	1,382		6	2
Bohol	176,798	9	200	45
Bulacan	275,928	1,349	13,667	203
Cagayan	142,161	65	789	127
Capiz	123,624	64	1,867	70
Cavite	121,555	27	528	39
Cebu	618,287	652	927	224
Cotabato	1,425	4	5	7
Dapitan	5,279		111	
Davao	9,002		49	14
Ilocos Norte	162,617	6	1,381	85
Ilocos Sur	130,869	21	578	42
Iloilo	211,829	757	2,312	463
Isabela	77,757	36	281	112
Jolo	13			2
La Laguna	125,354	580	853	105
La Union	91,510	13	203	101
Lepanto-Bontoc	2,258		20	
Leyte	275,680	69	1,072	85
Manila, City	51,581	994	2,148	580
Masbate	26,331	37	69	21
Mindoro	12,387		56	21
Misamis	97,545	34	583	34
Occidental Negros	180,929	1,030	4,554	931
Oriental Negros	140,372	60	77	33
Nueva Ecija	177,387	28	2,304	243
Nueva Vizcaya	16,193	7	64	168
Pampanga	280,300	1,011	10,780	238
Pangasinan	498,794	173	5,087	901
Paragua	23,202	7	27	24
Paragua Sur	1,743		4	17
Rizal	120,474	1,603	22,290	129
Romblon	40,735	7	254	21
Samar	96,021	24	320	10
Siassi	62		7	
Sorsogon	65,558	40	344	61
Surigao	44,814	11	395	6
Tarlac	261,483	230	1,398	454
Tayabas	142,225	56	469	39
Zambales	93,435	20	180	25
Zamboanga	10,018	3	364	59

Appendix III.

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910.

[From the Annual Report of the Insular Collector of Customs.]

Imports.	Quantity.	Total.	Value.	Total.
Cattle:	<i>Number.</i>			
China	19,167		P 998,302	
British East Indies	609		31,216	
Dutch East Indies	1		76	
French East Indies	23,996		681,114	
British Australasia	527	44,300	33,224	P 1,743,932
Horses:	<i>Number.</i>			
France	4		6,176	
China	18		1,312	
British East Indies	9		3,034	
French East Indies	66		1,600	
All other countries and ports in Asia	5		1,200	
British Australasia	459	561	96,470	109,792
Mules:	<i>Number.</i>			
China	35		6,956	
British East Indies	1	36	100	7,056
Hogs:	<i>Number.</i>			
Spain	1		2	
China	40		550	
French East Indies	10		46	
British Australasia	10	61	536	1,134
Sheep:	<i>Number.</i>			
China	21		206	
British Australasia	14	35	60	266
All other animals:	<i>Number.</i>			
United States	27		222	
United Kingdom	4		136	
Italy	2		10	
Spain	128		410	
China	3,558		3,578	
Singapore	5		16	
All other British East Indies	133		1,112	
French East Indies	377		414	
Hongkong	178		366	
Japan	267		496	
British Australasia	320	4,994	2,734	9,494
Total		49,987		1,871,674
Bones, hoofs, horns, etc:				
United States			4,812	
United Kingdom			12,638	
Austria-Hungary			30	
Belgium			10,326	
France			10,092	
Germany			10,128	
Italy			4	
Spain			3,972	
Switzerland			10	
China			3,456	
All other British East Indies			256	
Dutch East Indies			28	
French East Indies			20	
Hongkong			10	
Japan			7,460	
Siam			334	
Hawaiian Islands			10	63,586
Eggs:				
China			561,574	
Japan			38	561,612
Forward				625,198

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910—Continued.

Imports.	Quantity.	Total.	Value.	Total.
Brought forward -----				P625, 198
Hides and skins: -----				
United States -----			P172	
United Kingdom -----			14	
Germany -----			38	
Spain -----			3, 110	
China -----			72, 924	
British East Indies -----			74	
Hongkong -----			42	
Japan -----			40	
Korea -----			358	
				76, 772
Oils, animal: -----				
United States -----			4, 542	
United Kingdom -----			534	
France -----			24	
Germany -----			7, 362	
Italy -----			4	
China -----			178	
Japan -----			262	
British Australasia -----			4, 816	
				17, 722
Provisions, meats and dairy products: -----				
Beef products— -----				
Canned beef— -----	<i>Kilos.</i>			
United States -----	276, 751		142, 702	
United Kingdom -----	665		240	
France -----	25		14	
China -----	22		16	
Japan -----	22		8	
British Australasia -----	23		16	
		277, 508		142, 996
Fresh beef— -----	<i>Kilos.</i>			
China -----	86, 953		32, 878	
Hongkong -----	1, 731		504	
British Australasia -----	4, 816, 980		1, 588, 710	
		4, 905, 664		1, 617, 092
Salted or pickled beef— -----	<i>Kilos.</i>			
United States -----	699		114	
China -----	90		58	
British Australasia -----	558		412	
		1, 347		584
Cured beef— -----				
United States -----			10	
Netherlands -----			22	
British Australasia -----			36	
				68
Hog products— -----				
Bacon— -----	<i>Kilos.</i>			
United States -----	67, 754		57, 764	
United Kingdom -----	3, 191		2, 570	
Spain -----	2, 450		1, 686	
China -----	114		96	
Japan -----	227		100	
British Australasia -----	13, 990		11, 112	
		87, 726		73, 328
Hams— -----	<i>Kilos.</i>			
United States -----	47, 704		37, 660	
United Kingdom -----	83, 701		68, 600	
Belgium -----	218		238	
France -----	923		746	
Italy -----	48		56	
Spain -----	1, 236		1, 426	
China -----	468, 476		198, 500	
Japan -----	197		116	
British Australasia -----	66, 482		61, 898	
		668, 985		369, 240
Pork canned— -----	<i>Kilos.</i>			
United States -----	1, 057		562	
Spain -----	256		214	
China -----	89		44	
Japan -----	19		8	
British Australasia -----	196		40	
		1, 617		868
Forward -----				2, 923, 868

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910—Continued.

Imports.	Quantity.	Total.	Value.	Total.
Brought forward.....				₱2,923,868
Provisions, meats and dairy products—Contd.				
Hog products—Continued.				
Pork fresh—	Kilos.			
United States.....	22,645		₱15,212	
China.....	80		30	
Japan.....	3,373		874	
British Australasia.....	137,414	163,512	69,440	85,556
Pork, salted or pickled—	Kilos.			
United States.....	3,692		1,392	
Spain.....	69		64	
British East Indies.....	33		4	
Japan.....	18		8	
British Australasia.....	583	4,395	110	1,578
Lard—	Kilos.			
United States.....	90,501		44,146	
United Kingdom.....	64		42	
Spain.....	2,244		1,028	
China.....	1,748,609		432,536	
All other British East Indies.....	73		38	
Japan.....	5		2	
Turkey in Asia.....	59		28	
British Australasia.....	51,822		18,556	
Egypt.....	55	1,893,432	8	496,384
Mutton, fresh—	Kilos.			
United States.....	1,574		662	
British Australasia.....	325,684	327,258	86,404	87,066
Imitation butter—	Kilos.			
United Kingdom.....	816		432	
Germany.....	55		34	
Netherlands.....	29,047		18,216	
Spain.....	61		20	
China.....	11,938		8,366	
All other British East Indies.....	6,087		4,504	
British Australasia.....	55	48,059	36	31,608
Poultry and game—	Kilos.			
United States.....	734		732	
Spain.....	66		120	
China.....	1,411		708	
All other British East Indies.....	46		26	
French East Indies.....	422		154	
Hongkong.....	49		50	
Japan.....	2,855		2,202	
British Australasia.....	26,725	32,308	16,922	20,914
All other meat products—				
United States.....			131,284	
United Kingdom.....			17,850	
Belgium.....			540	
France.....			3,742	
Germany.....			2,708	
Italy.....			3,970	
Netherlands.....			14,952	
Spain.....			62,486	
Switzerland.....			454	
China.....			44,160	
Singapore.....			4	
All other British East Indies.....			924	
Japan.....			24	
British Australasia.....			35,384	318,482
Butter—	Kilos.			
United States.....	134		214	
United Kingdom.....	2,462		2,912	
Denmark.....	64,046		84,328	
Germany.....	2,967		3,868	
Italy.....	2,388		1,932	
Russia.....	197		124	
Switzerland.....	34		38	
Forward.....	72,228		93,776	3,965,456

Statement of imports into the Philippine Islands, of animals and animal products, for the year ending June 30, 1910—Continued.

Imports.	Quantity.	Total.	Value.	Total.
	<i>Kilos.</i>			
Brought forward.....	72, 228		₱93, 476	₱3, 965, 456
Provisions, meats and dairy products—Contd.				
Butter—Continued.				
China.....	216		158	
Turkey in Asia.....	9		4	
British Australasia.....	241, 022		253, 634	
		313, 475		347, 272
Cheese—	<i>Kilos.</i>			
United States.....	1, 656		1, 292	
United Kingdom.....	13, 493		8, 638	
Belgium.....	3, 016		2, 286	
France.....	2, 582		2, 234	
Germany.....	6, 939		5, 812	
Italy.....	419		400	
Netherlands.....	126, 571		84, 978	
Spain.....	718		534	
Switzerland.....	4, 549		3, 490	
China.....	770		90	
British East Indies.....	4		4	
Turkey in Asia.....	6		2	
British Australasia.....	4, 083		1, 732	
Egypt.....	65		12	
		164, 871		111, 504
Fresh milk—	<i>Kilos.</i>			
United Kingdom.....	3, 833		910	
France.....	2, 532		412	
Germany.....	49, 033		9, 766	
Italy.....	52, 677		7, 952	
Netherlands.....	21, 056		2, 854	
Norway.....	27, 986		5, 814	
Switzerland.....	425, 359		70, 920	
		582, 476		98, 628
Condensed milk—				
United States.....	779, 816		232, 850	
United Kingdom.....	1, 503, 911		537, 766	
France.....	5, 350		1, 292	
Germany.....	34, 283		7, 438	
Italy.....	72, 302		12, 246	
Netherlands.....	986		232	
Norway.....	232, 106		87, 448	
Switzerland.....	204, 385		56, 420	
Canada.....	55, 743		15, 732	
British Australasia.....	1, 043		340	
		2, 889, 925		951, 764
Total.....				5, 474, 624

SUMMARY.

Total number of animals imported 49,987, value.....	₱1,871,674
Total value of animal products imported exclusive of United States Army imports	5,474,624
Grand total	<u>7,346,298</u>
Animal products imported free by the United States Army into the Philippines:	
Beef, 7,417,929 pounds at ₱0.086.....	₱1,275,883.78
Mutton, 428,872 pounds at ₱0.075.....	64,330.80
Total of dutiable imports brought forward.....	<u>7,346,298.00</u>
Total importations	<u>8,686,512.58</u>

Appendix IV.

BREEDS OF MILCH CATTLE AND CARABAOS FOR THE PHILIPPINE ISLANDS.¹

By DAVID G. FAIRCHILD,

*Agricultural Explorer in charge of Foreign Explorations, Bureau of Plant Industry,
U. S. Department of Agriculture.*

During a stay in Ceylon and a visit to Poona, India, my attention was called to the question of the milk supply of these tropical regions.

Notwithstanding the marked improvement in the methods of milk sterilization, the continued use of canned milk and butter becomes finally, to anyone living in the tropics, unpleasant, and the question of securing fresh dairy products is a most important one for the comfort of European residents.

The best breeds of milch cattle, like Jerseys, Guernseys, and Holsteins, when introduced into the tropics very quickly degenerate. They are not suited to its climate and can not be easily acclimatized. They soon grow thin and sickly, cease giving large quantities of milk, and die.

In Ceylon several attempts to acclimatize them have been made, but with no success, and I am told that the dairymen who have made these trials have been obliged to return to the use of the South Indian or Madras breeds. Recently, however, the Sind cattle have come into prominence as a milch breed, and the introduction of this breed into other parts of India has been a great success. It is a remarkably vigorous race, and the cows are much better than the South Indian or Madras breed.

A visit made to the agricultural college in Colombo was very interesting in this connection. In the college herd the three breeds were represented.

The bulls of the Sind variety are great, handsome fellows, with immense humps on their shoulders, for they belong to the *Bos indicus* species. They were dark chestnut in color, with black extremities, and one could find nowhere healthier looking animals than these Sind specimens which were some time ago imported from Karachi. The cows were sleek coated, with large udders and fine broad backs—pictures of health. The Madras animals were of that long-legged, lean type which is so common in the Oriental tropics, and the cows had small udders and peaked backs; while the Jersey bull which had been

¹ From Bulletin No. 27, Bureau of Plant Industry, U. S. Department of Agriculture.

brought down from one of the high altitude tea estates, for breeding purposes, was a sad enough sight, pale about the eyes and mouth, sway-backed, and with hind legs all out of shape, though not nearly so ill-conditioned as the pitiful looking, emaciated cows of the same breed which were seemingly in the very last stages of consumption.

The object lesson could not have been more convincing nor the contrast between the perfect health of the Sind cattle and the mangy appearance of the European race more striking.

The statement by Mr. Driberg, the director, that without the Sind cattle it would be impossible to make up the Ceylon dairy was quite significant.

While in Poona, India, the site of the Bombay Agricultural School, I saw more of this Sind breed of cattle and learned that although it deserved all it was credited with in Ceylon, it has been superseded, for butter-making purposes, at least in the Bombay presidency, by the milch carabaos.

The carabao or water buffalo (*Bubalus bubalis* Lyd.) is a well-known object in Manila, and its use as a beast of burden thoroughly understood, but, so far as I am aware, little attention has been paid to it as a milk producer.

Unthinking prejudice, which prevents us from eating many excellent things, may play the same role in Manila that it does in Ceylon, and forbid the employment of the buffalo milk. If this is so it is a great pity, for there is a race of water buffaloes which come from Delhi, India, that gives over 30 pounds of milk per day, while the best Sind cattle give only 18, and this buffalo milk is so rich in fat that 12 to 13 pounds of it make a pound of butter, whereas 20 pounds of milk of a Sind cow are required.

These Delhi buffaloes are easier to keep, less expensive, and cleaner (having almost no hair) than ordinary cattle. They sell for about 180 rupees, or \$56 gold, in Bombay, and can be bought at Dawans, the buffalo market, near Grand Road Station, but could be best secured by applying to Mr. Mollison, director general of Agriculture for India, at Poona, who could probably be prevailed upon to arrange to have good specimens picked out.

In general, the animals are priced according to the amount of milk they give, 10 rupees being added to the price for every two additional pounds of milk given per day.

Another good variety of milch buffalo is that from Guj rat, called the Surti. It yields only about 20 pounds of milk per day, and is sold at from \$33 to \$36 gold. The cost of keeping

this variety per day amounts at Poona to only 16 cents gold, and it is considered the most economical race by Mr. Kelhar, the foreman in charge of the college herd. According to him, a dairy should have both buffaloes and Sind cattle. The buffaloes are better for butter production, and the cattle are superior for milk purposes, because the milk fetches a better price, being, in fact, much preferred to that of the buffaloes, which has a bluish color and a slight, though not disagreeable, odor.

Both the buffaloes from Delhi and Gujārat and the Sind cattle are well worth introducing into the Philippines. The buffaloes should be tested for butter making, though they cost more to feed than the Sind cattle, which latter will prove, however, especially useful for milk.

Breeding animals of these different races might be secured through Director Mollison, of Poona, who could arrange for their shipment to Manila through such a well-known shipping firm as Latham & Co., of Bombay.

As regards the quality of the butter made from buffaloes' milk, I can only judge from its general use in the Bombay presidency that it is in no way really objectionable, though its white color is not so attractive nor its aroma so full as that of Danish butter.

The introduction of these good milch breeds of cattle and buffaloes would add materially to the comfort of the white people in the Philippines, and deserves the serious attention of the Bureau of Agriculture.

Appendix V.

EXTRACTS FROM REPORT OF THE PROCEEDINGS OF A BOARD OF OFFICERS OF THE CIVIL GOVERNMENT OF THE PHILIPPINE ISLANDS AND OF THE UNITED STATES ARMY, APPOINTED BY THE SECRETARY OF WAR.

Report of Committee on Beef.

Committee.—Dr. G. E. Nesom, Director of Agriculture; Lieut. Col. David L. Brainard, Deputy Commissary General; Major C. R. Krauthoff, Commissary.

MANILA, P. I., December 10, 1910.

The committee appointed at the first meeting of the board, to investigate the native beef supply, with a view to substituting it, either wholly or in part, for the frozen Australian beef now

brought into the Philippines for Army use, submits the following report:

At the time of the American occupation in 1898 the Army was supplied with fresh beef from two ships that arrived from Australia with cargoes of frozen beef; these ships were the United States Navy boat *Culgoa* and the United States Army boat *Duke of Sutherland*. Australian frozen meats have been imported here ever since, for the Army. Only one shipload of beef came from the United States; this boat, the *Glacier*, arrived in 1899. In that year one hundred Indo-China beeves were also imported by the Army. These latter were killed, taken out to a refrigerating boat in the harbor and frozen, and an effort was then made to issue this beef to our troops. This meat, however, was so repugnant to the officers and enlisted men that they avoided it so successfully that finally the military authorities sold the remaining portion at auction, in open market.

Some study was made, a few years ago, of Japanese beef, with the hope that the requirements of the Army here might be met from that source; a shorter voyage than from Australia, but it was found that the purchasable Japanese beeves were both small and expensive. As no economy would be secured by this change, none was brought in.

From the above brief outline of the history of beef supply for the Army here, it will be seen that for years past, in fact from the very beginning of our occupation, the Army has used the frozen Australian beef; this is preferred to the American beef, because it costs less and has to come a much shorter distance, and equals in quality and quantity the home product, so far as our requirements here are concerned. Each year the military authorities here furnish circular proposals to all local dealers, calling upon them to submit bids for supplying the Army for the next fiscal year, but rarely are any local bids received. These circulars do not specify Australian beef, but call for beef of certain weight, quality, and quantity, delivered frozen in Manila. At present the Army contract is held by the Queensland Meat and Export and Agency Company (Limited), of Brisbane. The contract price for the fiscal year 1910 was \$0.081 gold per pound; this called for shipside delivery in Manila, up to October 1, 1909, when, owing to certain changes in tariff laws here, requiring the subsistence department to pay duty on this beef, the price changed to \$0.0857 gold per pound. The present price that went into effect July 1, 1910, for the present fiscal year of 1911, is \$0.08554 gold per pound.

The Army brought in from Australia, during the fiscal year 1910, the following:

7,417,929 pounds of beef, at \$0.086	\$637,941.89
428,872 pounds of mutton, at \$0.075	32,165.40
Total value	670,107.29

The amount brought in during the present fiscal year, 1911, which began July 1, 1910, has been as follows:

1,507,304 pounds of beef, at \$0.086,	\$129,628.14
85,876 pounds of mutton, at \$0.065,	5,581.94
Total value	135,210.08

This, in round numbers, means 8,000,000 of pounds of frozen beef needed annually by the Army in these Islands. At present it all comes directly from Australia to Manila, is unloaded and stored in the Manila Cold Storage Plant, then reshipped from that place to all of the stations in the Philippines as needed. The plan of the military authorities here is to keep always on hand, as a reserve, one full month's supply, about 670,000 pounds, and this is done. At the present time the beef ships arrive here about twice each month.

This Australian beef, used here by the Army now for almost thirteen years, has given almost steady satisfaction. At times some has had to be rejected, but this amount has been extremely small, and no more than it is natural to expect on any large and long contract. The beef has been found clean, palatable, thoroughly refrigerated, up to contract specifications, and preferred by our troops. Many reports, inquiries, and inspections have proved it to be all that it should be in quantity, quality, and in price. The prices at different posts in the United States vary, according to location of the posts, shipping and receiving facilities, amounts required, distance from packing houses, etc., but it is averaging about the same to-day at home, to the Government, as it is here.

Admitting that this Australian beef is to be preferred to the Japanese, Indo-Chinese, or American beef, for the reasons set forth above, we are led to the conviction that no change would be advisable unless it be possible to do one of two things—either use the native Philippine beef, or, failing to be able to do this, establish Government cattle ranches in these Islands. These two plans will now be set forth at length.

PART I.—NATIVE BEEF SUPPLY.

The supply of beef cattle in these Islands, suitable in every reasonable way for slaughtering purposes, is known to be very limited. No complete census has been made, so far as known, to determine the exact number, but the general knowledge of this committee regarding the whole Archipelago and the detailed knowledge of conditions around every post that has been furnished the committee by officers who are stationed in all of these places, establishes the fact beyond reasonable doubt that the number of native beef cattle is so limited as to preclude the possibility of substituting this native supply in sufficient quantities and of proper quality and at reasonable prices, in place of any portion of the present Australian beef.

Information obtained from practically every portion of the Archipelago enables this committee to regard 250 pounds as the dressed weight of the native beef steer. Dividing the 8,000,000 pounds needed annually for the Army by this divisor, it is seen that some 32,000 native steers would be required each year, and unquestionably the first year's purchase would so deplete the number of cattle in the Philippines as not only to make further purchases impossible for years to come, but would cause such a shortage of cattle here as to increase the price of native beef far beyond its present price, and thereby cause actual suffering to the native population, particularly the poorer classes.

By making careful inquiries of commissary officers throughout the Archipelago, who are naturally familiar with conditions in their localities, Table I is submitted herewith, showing the results of their recent investigations on this subject.

TABLE I.—*Estimate of number of native cattle available November 1, 1910, in the Philippine Islands, in vicinity of military posts, with estimated weight dressed and cost per pound in gold.*

No.	Locality.		Number of cattle.	Health of same.	Dressed weight pounds.	Cost on hoof.	Price per pound dressed.
	Post.	Province.					
1	Camp John Hay	Benguet	250	Good	250	\$50.00	\$0.20
2	Fort McKinley	Rizal	0				
3	Camp Eldredge	Laguna	0				
4	Camp Treadwell	Pampanga	0	Surra			
5	Fort Mills	Corregidor	0				
6	Iloilo	Panay	0	Poor	250	75.00	.15
7	Fort Wint	Grande	0				
8	Camp Stotsenberg	Pampanga	0	Work		40.00	
9	Camp Wilhelm	Tayabas	0				
10	Liguan	Albay	0				

TABLE I.—*Estimate of number of native cattle available November 1, 1910, in the Philippine Islands, in vicinity of military posts, with estimated weight dressed and cost per pound in gold—Continued.*

No.	Locality.		Number of cattle.	Health of same.	Dressed weight pounds.	Cost on hoof.	Price per pound dressed.
	Post.	Province.					
11	Calapan	Mindoro	* 500	Excellent	250	\$38.00	\$0.15
12	Camp Jossman	Guimaras	0	Poor			
13	Camp Gregg	Pangasinan	0	Fair ^b			
14	Warwick Barracks	Cebu	^a Few	Good	300	°.075	.125
15	Camp McGrath	Batangas	0	Good ^c	500	75.00	.25
16	Camp Wallace	Union	0				
17	Pettit Barracks	Mindanao	130	Good ^e	300	°.05	.10
18	Camp Bumpus	Leyte	20	Poor	300	50.00	.20
19	Camp Connell	Samar	6	Good			
20	Ipil	Mindanao	0				
21	Augur Barracks	Jolo	^b 6,000	Excellent	300	°.05	
22	Isabela	Basilan	100	Good	350		.25
23	Calapan	Mindoro	18,000	Good	400	18.00	
24	Landang	Sacol	0				
25	Camp Tampanan	Mindanao	0				
26	Torrey Barracks	do	0				
27	Bojelebung	Basilan	100	Poor	250	°.25	.30
28	Infanta	Tayabas	0				
29	Regan Barracks	Albay	162	Good ^d	275	19.00	
30	Reina Regente	Mindanao	0	Good			
31	Cotabato	do	50	Poor	150	°.10	.10
32	Tagabiran	Samar	0				
33	Camp Downs	Leyte	0				
34	Margosatubig	Mindanao	0				
35	Ludlow Barracks	do	^j 70	Good	300	°.075	.10
36	Camp Overton	do	0				
37	Camp Keithley	do	Few	Good		(^k)	
38	Momugan	do	0				
39	Pantar	do	0				
40	Camp Piso	do	^l 10	Excellent		30.00	
41	Dapitan	do	0				
42	Dalama	do	^m 0	Good	250	20.00	
43	Puerto Princesa	Palawan	ⁿ 30	do	225	°.09	.25
44	Pollac	Mindanao	100	do	400	°.03	.065
45	Camp Hayt	Samar	0	Bad	250		.25
46	Makar	Moro	^o 50	Good	400	15.00	
47	Camp Malita	Mindanao	0				
48	Davao	do	^p 6,000	Excellent	300	°.04	.09

* Other herds also on this island.

^b 3,000 to 4,000 head within shipping distance of this post.

^c Per pound.

^d These are mostly imported from China. No herds on Cebu. Report says three large herds of several thousand each, on Leyte Island.

^e Occasional rinderpest. Said to be 10,000 cattle on Mindoro Island.

^f Some small herds in the Batanes Islands, north of Luzon.

^g Some surra. Report states a few small herds here and some large herds in the Davao District and in Cagayan de Sulu.

^h No herds of beef cattle in Sulu Islands. Natives are being induced to raise their cattle now, and not to sell for some years to come.

ⁱ Some surra. Before insurrection raised famous cattle. Now very few because of disease. Island of Burias has some 200 head. 1,100 head in Masbate.

^j Can supply 300 head annually. Some herds at Davao.

^k None for sale.

^l Probably 100 in next two years. No disease in past eight years.

^m Reported herds near Glau, on Sarangani Bay, Mindanao.

ⁿ Reports herd of 700 at Abarlan.

^o All cattle here are running wild.

^p Believe that 10,000 head could be shipped out annually, if Government encouraged the industry here. Plenty for local garrison and some few thousands for export now.

In the above table, wherever no cattle are shown in the column headed "Number of cattle," and the other columns are filled in, work cattle are meant. Various provinces are seen

to be wholly lacking from the table, and these omitted provinces may have cattle or may not. This table is compiled from all of the reports that have been received up to date—December 1, 1910. Totalling up this table, as well as it is possible to do so, there is shown about 36,668 cattle now available as beef animals. Of the number reported above as “reported existing” it is too uncertain a source to calculate. The Bureau of Agriculture some time ago stated, in one of its publications, that “an accurate census of all of the cattle in the Philippine Islands has not been possible thus far, but the study and investigations thus far made seem to show some 200,000 cattle of all kinds.”

It will be noticed, from this table, that the price per pound, dressed, runs all the way from 6½ cents gold at Pollac to 30 cents gold at Bojelebung; such an extension as to furnish only a poor idea of the average price upon which the Government might estimate. It will also be noticed that a few places report the animal condition as poor; these unfit cattle must be deducted from the total of 36,668 head, but they only amount to a few hundred.

The four posts that report large numbers are:

	Head.
Camp Gregg	6,000
Calapán, Mindoro	18,000
Augur Barracks, Jolo	6,000
Davao, Mindanao	6,000
Total	36,000

A careful study of this matter convinces this committee that it would be impossible to depend upon these four provinces, because of the uncertainty of supply, the liability of epidemics of surra, rinderpest, foot-and-mouth disease, and other serious cattle diseases, as well as because it would be unwise to exterminate, by slaughter, all of these herds for years to come.

The idea of being able to change from the present Australian beef to the native beef is still more clearly shown to be impracticable at the present time, by referring to the annual report compiled by the Insular Collector of Customs, Manila. In fact, these statistics set forth that, in addition to what native beef was consumed, the following importations of beef cattle were made as given in Table 2 herewith.

TABLE 2.—*Importations of cattle into the Philippine Islands, for the fiscal years 1908, 1909 and 1910.*

Year.	Number.	Value (gold).	From countries as shown.	Number.
1908	43,157	\$1,055,236	Spain.....	1
			China.....	27,895
			Hongkong.....	217
			British East Indies.....	413
			French East Indies.....	14,574
			British Australasia.....	52
			Total.....	43,157
1909	40,367	755,772	Spain.....	1
			China.....	16,068
			Hongkong.....	85
			British East Indies.....	521
			French East Indies.....	23,597
			British Australasia.....	95
			Total.....	40,367
1910	44,300	871,966	China.....	19,167
			British East Indies.....	609
			Dutch East Indies.....	1
			French East Indies.....	23,996
			British Australasia.....	527
			Total.....	44,300

In order to appreciate Table 2 still further, it must be remembered that even the native beef plus all of this imported beef, does not represent the meat required or consumed here by the civil population, for to show this would necessitate adding all of the canned meats, mutton, ham, etc., brought in, as well as the 8,000,000 pounds annually used by the Army. This appears to this committee to be very conclusive evidence that the native beef supply can not yet be used by the Army. No business firm here would import beef, if palatable and sufficient native beef could be used.

It is conceded that the question of palatability is also an important one, and that in this respect the beef used must be agreeable to those for whom it is intended. Table 3 herewith is submitted as giving the opinions of the forty-eight posts mentioned in Table I.

TABLE 3.—*Opinions from 48 Army posts in the Philippines, as to the palatability of native beef, compared to the frozen Australian beef now furnished the Army.*

Opinion.	Posts.	Remarks accompanying same.
Favorable.....	9	These posts believe some trials might be made, under careful Government supervision.
Unfavorable.....	23	Meat found tough, stringy, no flavor, dry, unpalatable generally, unwholesome, flabby, supply too uncertain, too much disease prevalent.
Negative.....	16	Never used native beef. All of the others have had more or less experience with it.
Prefer Australian frozen beef.	39	Are unqualifiedly in favor of the present supply.

The committee is also of the opinion that the prevalence of rinderpest, surra, foot-and-mouth disease, and other forms of sickness among the native cattle is something which would further operate against the use of this beef at present and for some years to come. While the efforts of the Bureau of Agriculture are being directed toward the extermination of cattle diseases here, much time must elapse before such a condition of general health is reached as to encourage cattle raisers to return to their work and exhibit a willingness to invest large sums.

Much study has been given this subject by the military authorities here, in past years, and the following résumé of the opinions reached by others, from time to time, is given below in Table 4.

TABLE 4.—*Reports of various military authorities, on native Philippine beef.*

No.	Authority.	Date.	Extract from report.
1	Chief commissary, Philippines Division.	July 1, 1900	"The problem of supplying fresh meat to the troops has been the one presenting the greatest difficulties. There are comparatively few cattle in these Islands. They are very small and very subject to disease. On February 9, 1900, general authority was given to all commissaries at posts which could not be reached by frozen beef, to purchase in vicinity of posts such beef as could be procured. Under this authority a large number of posts have obtained fresh beef, ranging in quantity from a full supply down to 2 days in 10. At a number of posts no beef could be procured. The quality of the beef so procured is reported as inferior."
2	Chief commissary, Department of Northern Luzon	July 1, 1902	"As a result of the ravages of rinderpest among the native cattle, a fresh-beef famine has existed among the Islands for two years past. Small numbers of cattle have at times been purchased in the Island of Tuga, 40 miles north of Luzon, and shipped by transport to Aparri, to Vigan and San Fernando, Union, and thence distributed to interior points, the price paid at point of purchase being about \$25 gold per head, the cattle averaging about 200 to 250 pounds net beef. At some few points of the department—as at Cervantes, Lepanto; Concepcion, Lepanto; Gazan and Boac, Island of Marinduque; Mangarin and Pinamalayan, Island of Mindoro; Mauban and Atimonan, Tayabas—limited quantities of beef have been irregularly purchased at prices ranging from \$0.063366 per pound on the Island of Mindoro, to \$0.20 in Tayabas and Lepanto. This source of supply is now practically exhausted, and stations generally depend for their beef on the frozen article purchased in Australia, brought thence by refrigerator steamer and shipped from Manila by transport and coast lines, launch and rail to a large number of stations in all parts of the department, from which it is further distributed by cascocs, wagons, bull carts and pack mules to the points more remote."
3	Commanding General, Department of Southern Philippines.	Aug. 8, 1902	"Disease (rinderpest) and a lack of any systematic attempt to breed cattle has depleted the Islands of native cattle so that the supply is quite wholly dependent upon imported refrigerated meat."
4	Chief commissary, Seventh Separate Brigade, Zamboanga.	June 30, 1902	"Beef cattle were purchased at points in Paragua and at Davao and shipped to north coast posts, and also to Parang, with the result that most of them died of rinderpest, and this plan of supply was at once abandoned."

TABLE 4.—*Reports of various military authorities, on native Philippine beef—Continued.*

No.	Authority.	Date.	Extract from report.
5	Chief commissary, Philippines Division.	July 13, 1906	"It would seem desirable that some method be adopted to encourage the raising of beef cattle in this locality, and I recommend consideration of the Army co-operating with the Civil Government by taking its supply of beef for troops in this division from persons entrusted with such a scheme. On account of disease, of course, capitalists are afraid to invest in cattle to be grazed and raised in the Islands, although in former years great numbers of cattle were raised in certain localities inexpensively and with profit. It would seem desirable to undertake, under Government supervision and perhaps at Government expense, the raising of cattle for local slaughter and refrigeration in the Islands."
6	Chief commissary, Philippines Division.	Sept 1, 1910	"Owing to the lack of native cattle, many beef animals are imported in the Philippines from China, French East Indies, and Australia. The value of the cattle imported in 1909 amounted to nearly \$1,000,000. It is understood that a large percentage of the native cattle in these Islands are afflicted with tuberculosis. The quality of the beef is inferior to the beef consumed by the most impoverished laborer in the United States."
7	The commissary, Camp John Hay, Benguet.	Sept. 3, 1910	"The quality of native beef purchased during the typhoon season of last year was fairly good. The first lot furnished was not satisfactory, on account of not being properly bled, but later deliveries were required to be bled freely and then thoroughly frozen, which gave much better satisfaction. Price paid per pound, \$0.15."
8	Chief commissary, Department of Luzon.	Aug. 30, 1910	"Native beef purchased at Puerto Princesa, Palawan, for two companies of Philippine Scouts, in November, 1905, at \$0.10 gold per pound. The commanding officer of that post, on May 27, 1909, reported as follows: This beef is of a very poor quality, being poor, stringy, and in my opinion not very nutritious. In fact, I do not eat it myself, and the enlisted men do not like it. It is necessary to cook the same before the animal heat leaves the body to keep it from spoiling, and about the only way it can be used is to boil it."
9	Chief commissary, Philippines Division.	Nov. 19, 1910	"All fresh beef used at Malabang, Mindanao, between November or December, 1900, and October, 1901—some twelve months—was native beef, which was purchased on the hoof, grazed from two weeks to two months, depending on the condition of beef, size of herd, etc., and slaughtered by the soldiers. The beef was inspected by surgeon when slaughtered and dressed. No diseased beef was found. Quality excellent and gave universal satisfaction. Size, small. Cost, 4 to 6 cents per pound, gradually rising toward end of period, when supply was presumably being decreased. The tall cogon grass was cut and burned and the new grass growing up made excellent grazing for the cattle. Size of herd averaged 20 head. These cattle were purchased weekly in market, from Moros. Cows were principally used."
10	Chief commissary, Philippines Division.	July 15, 1910	"Frozen beef of hind quarters only, and mutton, as in the past, are supplied from Australia, under annual contract, and deliveries are made monthly at the Insular Cold Storage Plant, in this city (Manila). Under instructions from the Commissary-General, to experiment with frozen beef that had been in cold storage for considerable periods, several quarters of the regular beef received under contract from Australia were put aside for this purpose on April 20, 1908; one quarter was examined April 20, 1909, and found to be in excellent condition. A second quarter was withdrawn on May 31, 1910, after a period of over two years had elapsed, and samples turned over to the Medical Department of the Army and to the Insular Bureau of Science for bacteriological and chemical examination and feeding tests, and the tests demonstrated that fresh beef, under stress of circumstances, may be kept in good condition for two years or longer, provided a low and uniform temperature be maintained."

TABLE 4.—*Reports of various military authorities, on native Philippine beef—Continued.*

No.	Authority.	Date.	Extract from report.
11	Acting Director, Bureau of Agri- culture.	Sept. 17, 1910	"There are no accurate figures at present relative to the number of native cattle in these Islands; the number is estimated to be about 200,000. A very small percentage of this number is available for beef purposes. The animals that are killed for beef are usually killed in the vicinity in which they are raised, for local consumption. During the past fiscal year 2,936 native cattle were received in Manila and practically all of these were killed for beef."

In order to determine how much native beef is being consumed annually in and around Manila, the principal dealers in Manila have been consulted, and Table 5 below shows business done during the past year.

TABLE 5.—*Native beef handled by the leading meat dealers and cold storage companies of Manila, during the past year.*

No.	Firm.	Amount of native beef.	Remarks.
1	Lack & Davis.....	None.....	Never handled native beef; handles imported meats altogether; beeves from Indo China, China, Hongkong are used. States no native beef cattle exist here. Can furnish Hongkong beef, equal fore and hind quarters, frozen, at 7 cents gold per pound. This would mean an annual saving to the Government of \$118,000 gold against Australian beef now bought. This saving would be greater the following year, by competition. Beef said to be excellent, and is now being furnished the Government at Bilibid Prison.
2	Faustino Lichauco.	None.....	Never handled native beef; reason, poor and scarce. Brings in Australian, Chinese, and French East Indian beef on hoof and slaughters here. Is preparing refrigerator steamers to bring Australian beef here, and will be prepared to furnish same to Government at about 5 cents gold per pound, delivered in Manila, as soon as his steamers are ready—in about six months. Will be same beef as Army gets now.
3	Castle Bros.-Wolf & Sons.	None.....	Never handled native beef; reason, poor and scarce. Imports wholly Australian.
4	Philippine Cold Storage.	None.....	Never handled native beef; reason, poor and scarce. Imports from China and Hongkong only.
5	Independent Cold Storage.	None.....	Same remarks as No. 4 above.
6	International Cold Storage.	None.....	Only handles American and Australian beef.
7	Slaughterhouse	All beef cattle coming to Manila are slaughtered here and officials state that in one year not over 100 native beef cattle are slaughtered here, and these are very poor.

Before closing this consideration of native beef under present conditions, the committee desires to lay before the board the seriousness of the epidemic diseases prevalent throughout the Philippine Islands; the three most serious are rinderpest, surra, and foot-and-mouth disease. The spread of any contagious disease is usually due, in a measure, to lack of information on the part of the people. This is particularly true in a country like

the Philippines, where the means of disseminating information are comparatively limited. The Bureau of Agriculture has prepared and distributed pamphlets and circulars to all municipalities and as many barrios as possible; these circulars contain descriptions of the various diseases of cattle, the symptoms, how sick animals should be cared for, what steps should be taken to prevent the spread of disease, etc. All provincial governors, municipal presidents, and district health officers, in all of the provinces, have been asked to coöperate in spreading the information contained in these circulars. The Bureau of Agriculture has long been laboring to lessen, and if possible eliminate, wholly, these diseases, sending experienced veterinarians to any district reporting disease. Nevertheless, enormous losses have resulted throughout the Islands, and at any time one of these diseases is liable to suddenly appear in some district and sweep away practically all of the cattle there. Should the Army attempt to rely at present on the native beef supply, even in part, this source of sudden stoppage of supply must never be disregarded, with the consequent high price the Government would then have to pay in making emergency purchases, at short notice, to fulfill the demands of the service.

The following reports of the Bureau of Agriculture are submitted:

TABLE 6.—*Cattle diseases now existing in the Philippine Islands, 1910.*

[From the Agricultural Review.]

No.	Date.	Extract.
1	August, 1910.....	"Rinderpest is a contagious and infectious disease which attacks cattle, carabaos, hogs, goats, deer and other animals. This disease has destroyed thousands upon thousands of cattle and carabaos and has caused enormous losses throughout the Philippines. Rinderpest exists to-day and many parts of these Islands and new outbreaks frequently occur. This disease can be controlled and the country entirely freed from it, but this work can only be done with the active and intelligent assistance of all local officials and all persons who own or use cattle or carabao."
2	January, 1910 ----	"Only two serious outbreaks of rinderpest occurred in 1909; one was in the Cagayan Valley and one in the Island of Siquijor. During the year 22,285 carabaos and 6,469 cattle were inoculated with anti-rinderpest serum; 3,322 carabaos and 312 cattle were reinoculated; 639 carabaos and 153 cattle died after inoculation". This report does not state how many died beforehand.
3	January, 1910 ----	"Surra is undoubtedly second in importance to rinderpest, and it has apparently been more prevalent this year than last. Reports have come in from 18 provinces. The only serious outbreaks have been on the Islands of Marinduque and Bohol, where it has done considerable damage. A total of 779 animals were found infected; 329 were killed and 166 other deaths are reported. For the first time in several years this disease appeared in Manila during April 1909; it was soon eradicated and did comparatively little damage."
4	January, 1910 ----	"Glanders has been found in 18 provinces, but no serious outbreaks."
5	January, 1910 ----	"Foot-and-mouth disease has given considerable trouble in various sections of the Islands. It has appeared in some 23 provinces, but it has steadily decreased by improved quarantine service, and at the present time, January 1910, the provinces are comparatively clean. Some 10,673 animals were infected, and 125 deaths are reported."
6	January, 1910 ----	"One hundred cases of ulcerative lymphangitis and nine deaths were reported from ten provinces."

TABLE 6.—*Cattle diseases now existing in the Philippine Islands, 1910—Continued.*

No.	Date.	Extract.
7	July, 1910.....	<p>"When General Orders No. 15, which is now published to the Islands, went into effect, it marked a turning point in the history of animal diseases in the Philippine Islands. For nearly 25 years rinderpest has prevailed here, and during recent years both surra and foot-and-mouth disease have gained a strong foothold. For the past ten years the imports of livestock into these Islands, mostly from the Chinese Empire, have been from forty to fifty thousand head of cattle and carabaos per annum. During the past three years practically all shipments of live stock that have arrived here from China have been infected with one or more of the above named diseases. More animals thus imported into the Philippine Islands have been affected with foot-and-mouth disease than with either of the other two diseases named; but the constant introduction of rinderpest infection by means of these importations has been the most prolific source of this disease, and has been found the most serious menace to the live-stock interests of this country. There have been two conflicting interests always present; one, the demand for more cattle to replace those that had died of disease; the other, the constant reintroduction of diseases against which a campaign was being waged. All parties concerned have exerted every possible effort to secure such action on the part of the Government as would be favorable to their own special interests. The men who have made the strongest demands for the privilege of importing cattle, even though it was known that such cattle were constantly bringing in disease, have been the cattle dealers of Manila. The policy of the Government for the past ten years has been to permit the importation of live stock under certain restrictions, even though it might be infected. At the time that the Bureau of Agriculture was transferred to the Department of Public Instruction, this matter was taken up for consideration with the result that the policy was changed so as to prohibit the bringing into the Islands of infected animals. General Order No. 15 had the immediate effect of excluding infected cattle coming from the ports along the China coast, although it did not exclude cattle coming from Indo China. There is now developing an extensive cattle business between Australia and the Philippines which promises to supply the demand for slaughter cattle in the Philippines. The larger part of the cattle imported for work purposes are carabaos coming from the vicinity of Saigon, Indo China.</p> <p>"With the prospects as bright as they are at the present time for the entire suppression of contagious diseases of animals in the Philippine Islands, there is reason to believe that the native animals will increase to such an extent as to largely take the place of the supply previously imported. The new policy of the Government with respect to the exclusion of animal diseases, and the guarding of the live stock industry so that the supply of live stock of the Islands may be replaced by local production, is one that should of receive the heartiest approval and support of all.</p>

To further appreciate the matter of prevalent cattle diseases the following brief table is submitted:

TABLE 7.—*Statistics relating to diseases of the Islands; compiled from weekly reports of veterinarians and inoculators, published in the Agricultural Review of January, 1910.*

Disease.	Number of provinces reported.	Number of animals affected.	Approximate number of animals exposed.	Deaths.	Killed.
Rinderpest.....	34	8,605	109,089	6,128	15
Surra.....	18	779	12,438	497	329
Glanders.....	18	312	1,179	56	48
Foot-and-mouth disease.....	23	10,673	1,487	125	-----
Lymphangitis.....	10	100	75	9	-----
Septicemia.....	5	67	2,122	18	-----
Hog cholera.....	4	67	960	68	-----

PART II.—CATTLE RANCHES.

The idea of the establishment of cattle ranches by the Government, or at any rate under careful governmental supervision, has been considered by various officials almost ever since the American occupation. Some have been in favor of experimental work and others not at all, the opinions varying from the conviction that it would be a success to the directly opposite view. By reference to Table 4, item No. 5, it will be seen that the chief commissary, Philippines Division, submitted such a recommendation as early as July, 1906.

The Bureau of Agriculture, at the Alabang experimental farm, has carried on various experiments, all very thoroughly, in the raising of cattle in these Islands, and the official report, as contained in the AGRICULTURAL REVIEW of January, 1910, reads as follows:

The American and Australian cattle kept at this farm have not done well, in spite of the fact that they have received at all times a liberal ration of concentrated feed. The young calves are always weak and many of them die before the weaning period, while the mestizo calves and Chinese cows have kept in good condition upon nothing but native grass, even during the dry season. A sufficient length of time has been given to this matter to settle practically once and for all the question of growing pure bred cattle from the temperate zone, and it is recommended that no further attempt be made to grow this class of cattle, but to confine our efforts to the growing of mestizos, using the Chinese or Spanish cows and high grade mestizo or full-blood American or Australian bulls.

The same publication gives the following report on the Trinidad experimental stock farm:

The cattle kept at this station consist of one herd of about forty native cows and a Galloway bull. The offspring are very thrifty and thrive on the pasture, requiring little help by feeding except during baguios and continued rainfalls. A good many of the mestizo bulls have been scattered throughout the provinces and good reports come from them wherever they have been placed.

These experiences indicate that, if the Government ever undertakes cattle raising here, no experiment would pay if using American or Australian *cows*; the Chinese, Spanish and native cows must be used, covered by Galloway, full-blood American or Australian, or high grade mestizo bulls.

About December, 1909, Lieut. Col. D. L. Brainard, the present chief commissary, Philippines Division, gave this cattle-raising subject considerable study, and was assisted by Capt. F. H. Lawton, chief commissary, Department of Mindanao. Appreciating the many advantages possessed by the Island of Mindanao for cattle raising, Colonel Brainard, on December 15, 1909, called on Captain Lawton, then in Mindanao, for a full

report in the matter. The report submitted follows herewith, verbatim:

HEADQUARTERS DEPARTMENT OF MINDANAO,
OFFICE CHIEF COMMISSARY,
Zamboanga, January 2, 1910.

Lieut. Col. D. L. BRAINARD,

Chief Commissary, Philippines Division, Manila, P. I.

COLONEL: In compliance with your letter (11556) of December 15 relative to a subsistence department herd of beef cattle in this department, I have the honor to make the following report:

One of the valleys mentioned by me lies north from Makar, which is situated on Sarangani Bay at the southern point of Mindanao, and has been very favorably reported upon by Major Heiberg, Philippine Scouts. Extract copy of his report enclosed herewith. General Pershing has also informed me that he knows this section and it is, in his opinion, the best available location.

The other valley lies to the south and eastward of Cagayan in Bukidnon. It has not been visited as far as I can determine by any but civilians, and I can make no definite report thereon, although I am informed that there is a large tract of good grazing land in the shape of a triangle which is practically enclosed by three rivers.

Investigation shows that there are comparatively few beef cattle being raised in Mindanao at present, due, it is believed, to an epidemic of rinderpest some years ago. The few cattle that are now being raised are doing exceptionally well.

The subject of rinderpest and surra and the probability of its appearance again, have been gone into, and it is not believed the risk is great enough to be considered. Its ravages in the past among the natives has been due largely to the fact that upon its appearance in one herd natives in that vicinity would take their cattle, after they had been exposed, and travel to another section, thereby introducing the disease there, which in turn would be carried on by the people of that section. Very little was known of the disease and absolutely no attempt made to eradicate it. With strict quarantine arrangements and a competent veterinarian there would be practically no danger under the system of successful vaccination that has been envolved by the Bureau of Science, making it possible to stamp out this disease at any time should it make its appearance.

The class of cattle met with in Mindanao are native, small and of beef type. When in good condition for slaughter, they weigh from 500 to 700 pounds and dress more than 50 per cent. Cattle in the hands of the Moros are much larger than those in the hands of Filipinos because the former take more pains in breeding. In this section there has been considerable crossing of the "sacred cattle of India" with native stock, with disastrous results, producing neither a milk nor a beef animal, the legs being long, flank cut high up, and size of bone increased.

During the past year a few range cattle from Port Darwin, Australia, have been brought in and turned out on the range. I have been informed by the veterinarian that none of these animals have shown any ill effects from the ticks or climate, and that they take well to the range and grass.

It is recommended that, if the approval of the division and department commanders can be obtained, an experiment be tried in the valley north of Makar, such number of selected native cows as may be determined upon being purchased from the herds at Mati, Davao, together with some Aus-

tralian bulls and cows, preferably from the northern part of Australia where the climate is somewhat similar.

A more detailed report with reference to the number of animals, cost, personnel, etc., will be furnished when desired."

The inclosure mentioned above follows herewith:

THE GOVERNMENT OF THE MORO PROVINCE,
OFFICE DISTRICT GOVERNOR, DISTRICT OF COTABATO,
Cotabato, September 30, 1909.

The PROVINCIAL SECRETARY,

Moro Province, Zamboanga, Moro, P. I.

SIR: The country between Makar and Kulanadal is a beautiful, open, gradually rising plain, covered with grass about knee-high and crossed every five or ten miles by mountain streams of clear, cool water. It reminds me very much of certain portions of eastern Wyoming, being decidedly temperate and untropical in appearance. The soil seems to become richer as we advance up the valley.

All in all, this is the finest stretch of country I have seen in the Philippines, and it appealed to me as being especially adapted to cattle raising. The grass is not cogon, and if kept short by frequent burning would, I believe, make good grazing. The Sultan of Talik had a number of ponies and Australian cattle, the former were poor specimens (thin and sore-backed from hard use and abuse), but the latter looked fat and in excellent condition.

This latter report is by Major Heiberg, of the Philippine Scouts, district governor of Cotabato. In a further report by Captain Lawton, dated Zamboanga, February 18, 1910, he furnishes the following information on this subject:

Selected native cows can be purchased in the Davao country at about ₱55 each. Shorthorn bulls from Queensland, Australia, can be purchased and landed here at about ₱300 each. Bengali bulls can be purchased in Singapore for about ₱200 each. The more thoroughly I go into this matter the more convinced I become that it would be a success if tried; my plan would be to secure first of all the services of a competent veterinarian, one who has devoted his time to cattle (I believe Doctor Oliver to be such a man), together with an interpreter and a detail of six enlisted men selected in the division for their knowledge of cattle.

The purchase of as many native cows as might be decided upon and a Shorthorn bull for about every one hundred cows, if their number were large, otherwise one bull to every fifty cows. I would also have a few Bengali bulls for experimental purposes—as some people with experience consider that the best results would be obtained from half-breed product of native cows and Bengali bulls and then to cross with the Shorthorn; all of these animals should be selected by the veterinarian, especially the Australian cattle, as they come from the sections of Queensland that have a climate similar to this and should be immune to "tick fever."

General Pershing has informed me that a company of scouts will be stationed at Makar which would furnish ample protection. Native herders can be secured at from ₱20 to ₱30 per month; I am informed that one native can look after one hundred to one hundred and fifty animals.

While this subject was still under consideration, the following correspondence occurred, bearing directly upon the cattle raising proposition:

HEADQUARTERS DEPARTMENT OF MINDANAO,
Zamboanga, P. I., April 23, 1910.

The ADJUTANT-GENERAL,

Philippines Division, Manila, P. I.

SIR: I have the honor to invite attention to the practicability of utilizing the country about Sarangani Bay for grazing purposes, with a view to the possibility of supplying troops in the Philippines with fresh beef. If we continue dependent upon outside sources for the supply of meat for the Army, it is possible that in the event of a complication with a foreign country the Army might find itself cut off from this component of the ration.

The country surrounding Sarangani Bay, especially on the northeast, north and west, is as fine grazing land as I have ever seen. It extends inward toward Lake Buluan, a distance of about fifty miles. The relative situation of the adjacent hills and mountains is such that precipitation takes place at the higher altitudes, and the rainfall of the territory in question is much less than in any other part of the Philippines within my knowledge. The several streams flowing through this section afford a bounteous supply of clear, cool water from the mountains.

The grass is very much like the grama grass of New Mexico and Arizona, which is considered very nutritious. During my visit there in the early part of the present month, I saw at Glau, near the entrance to Sarangani Bay, a herd of about one hundred grass-fed cattle that looked as sleek and fat as corn-fed cattle. They were in excellent condition and would be considered first-class beef cattle in any market.

I am informed that rinderpest has never appeared in that part of Mindanao. All the conditions are such that there should be no difficulty in raising all the cattle needed for meat supply of troops serving in the Philippines; besides the money sent abroad annually for meat might as well be kept within our own possessions.

It is suggested that this matter be taken up for consideration by the subsistence department.

Very respectfully,

(Signed) JOHN J. PERSHING,
Brigadier General, U. S. Army, Commanding.

First indorsement.

HEADQUARTERS, PHILIPPINES DIVISION,
OFFICE CHIEF COMMISSARY,
Manila, May 23, 1910.

Respectfully returned to the adjutant-general, Philippines Division, Manila, with remark that the project of maintaining a herd of beef cattle in Mindanao for use of the Army was first brought to the attention of this office in November, 1909, by Captain Lawton, then chief commissary, Department of Mindanao; but no action was taken at that time as it was regarded as a matter requiring careful investigation and consideration. The correspondence above referred to is herewith inclosed. (This is the correspondence just preceding.)

To supply the troops in these Islands with fresh beef from cattle owned by the Government would necessitate stocking the ranges, the construction of ranches, slaughterhouses, a modern cold-storage plant, offices, quarters

for employees, tracks and cars for loading and handling the meat, both in the green and frozen state, and the purchase of hundreds of articles of equipment required in an up-to-date slaughtering and freezing plant. Many of the cattle and horses would be brought from Australia, India, and the United States; the material for buildings from the United States and the equipment from the United States or Europe. The animals and material would have to be transported for great distances and at enormous expense; add to this the cost of installing and equipping a modern plant in a remote locality and the total amount involved would be so large as to be prohibitive. The cost of maintenance of such a plant would be very great to say nothing of the loss of animals through epidemics and by the predatory Moro. Moreover, should the Philippine Islands be invaded by the army of a foreign power, it may be assumed that a sufficient force would be at once detached from the hostile army and sent to Mindanao to relieve the subsistence department of any further care and responsibility of the cattle herds and the plant connected therewith. Thus the United States Army, by means of its own resources, would contribute to the aid and comfort of the invaders.

The Army can not enter into competition with established business houses in these Islands, hence any plant constructed by the Government would be used for its needs alone. The amount of business transacted in the Army would not justify the large expenditures necessary to properly build, equip, and maintain a plant of the size required, for its sole use. In commercial packing houses no part of the animal is lost, the whole carcass is transformed into by-products which augment the profits of the establishment and assist in paying the fixed charges. In an Army plant this could not, or rather would not, be done. The by-products would not be utilized, because the Government could not appear as a competitor with commercial firms.

The present force in the Philippines uses approximately 8,000,000 pounds frozen beef and mutton per year at a cost of about 8½ cents per pound for beef and 6½ cents per pound for mutton, which includes transportation and duties. This meat is transported from Australia in refrigerator ships, the contractor assuming all the risks; it is transferred to the Insular Cold Storage Plant and is later distributed throughout the Islands in our own vessels at a minimum of cost. The system is as nearly perfect as it is possible to make it; there is practically no loss; the method of handling is cleanly, each quarter being inclosed in a muslin slip and an outer covering of burlap. The price is reasonable, cheaper than meat of the same quality can be imported from the United States, and by this method of supply we are not putting all our eggs into one basket.

Attention is invited to the inclosed memorandum prepared for this office by the depot commissary, Manila.

It is recommended that, in the best interests of the service, the within suggestion be not considered at this time.

(Signed) D. L. BRAINARD,

Lieutenant Colonel, D. C. G., U. S. Army, Chief Commissary.

The memorandum referred to in this indorsement of Colonel Brainard appears below, and was prepared very carefully by Major Krauthoff, of the commissary department and a member of this committee. It will be seen that such an undertaking is enormous and costly.

DEPOT COMMISSARY, UNITED STATES ARMY,

Manila, P. I.

Memorandum for the chief commissary, Philippines Division, in connection with letter of the Commanding-General, Department of Mindanao, dated April 23, 1910.

Quantity of fresh meat required by the Army in the Philippine Islands per year, 8,000,000 pounds.

Number of cattle required to furnish that quantity of meat.—The average steer or heifer 3 years old will dress, trimmed according to specifications, about 500 pounds, and it will be necessary to slaughter 16,000 cattle per annum.

Herd required for slaughtering.—To provide 16,000 cattle annually, requires a herd as follows:

16,000 cattle 1 year old,
16,000 cattle 2 years old,
16,000 cattle 3 years old.

The three year olds will constitute the slaughtering herd, and drawn from as required.

Herd required for breeding.—To start the slaughtering herd, it will be necessary to have a crop of over 16,000 calves per annum.

There are many losses, due to disease, accident, and loss of calves, besides a portion of the cows are apt to prove to be without calves.

Fifty per cent gain in numbers may be considered a good average, counting losses of calves, yearlings, two and three year olds.

A certain number of heifers and bull calves must be reserved each year to keep up breeding herd.

To start the herd will require about 32,000 cows and at least 800 bulls.

Good, young Australian cows would cost about \$50 and thorough-bred bulls at least \$150, making the initial cost of herd \$1,720,000.

After starting the ranch the herd would be theoretically as follows:

End of first year:

Cows	32,000
Bulls	800
Yearlings	16,000
Total	48,800

End of second year:

Cows	32,000
Bulls	800
Yearlings	16,000
2-year-olds	16,000
Total	64,800

End of third year:

Cows	32,000
Bulls	800
Yearlings	16,000
2-year-olds	16,000
3-year-olds	16,000
Total	80,800

Beginning the fourth year, the 3-year-old cattle will be ready for slaughter.

Ranches.—The ranch would have to be divided into a number of ranches, each in charge of a ranch boss and necessary assistants; the various ranches being under charge of the head ranch boss. Buildings and corrals, fences, etc., would have to be provided.

Packing house.—A modern packing house, having a capacity for slaughtering 75 cattle daily, together with chill rooms and cold storage rooms for 750 carcasses of frozen beef would have to be built at or near the ranch, and at a place where steamers could receive and discharge cargoes.

The necessary appliances to care for the offal and waste products must be provided.

Refrigerator ships.—The principal distributing point for frozen beef is Manila, or very near Manila if any change is to be made. A refrigerator ship would be necessary to transport the frozen beef from the packing house to Manila.

In case of war.—In the event of war, the main body of our Army would be at or near Manila. It would be impossible to protect the lines of communication between the Army and the meat supply, provided the enemy was at all aggressive. In case of war, if time would permit, several shiploads of frozen beef would be rushed from Australia, and if that can not be done we will have to eat bacon and canned meats.

Horses.—A large number of horses would be required for ranch work.

Remarks.—The above data is based on the assumption that all fresh beef required for the troops in the Philippines would be raised on the ranch.

All of the above investigations regarding cattle ranches refer to the establishment of these ranches on the Island of Mindanao. Therefore, the following letter from Governor Van Schaick, of Mindoro, opens up knowledge of another Island favorable for such a project, and somewhat nearer Manila. In considering the detailed estimate of Major Krauthoff, the committee believes that for more cattle would probably be needed, as the estimated dressed weight of the native steer or heifer is believed to be nearer 250 pounds than the 500 pounds he has stated. The letter from Governor Van Schaick follows:

PROVINCIAL GOVERNMENT OF MINDORO,
Calapan, P. I., September 24, 1910.

Lieutenant JOHN W. WILEN,

U. S. Army, Camp McGrath, Batangas, Batangas, P. I.

DEAR SIR: In reply to your letter of September 20, I have the honor to inform you that there are approximately 18,000 head of cattle on Mindoro; 5,000 south of the sugar estate, on the Caguray River, owned by the friars and concerning which information can be had from the Procurador de los Recoletos, Manila, P. I.; 5,000 more near Sablayan, owned by Pedro Fernandez, Sablayan, Mindoro; 2,000 near Abra de Ilog, owned by Manuel Lopez, Balayan, Batangas; and 1,000 near Paluan, owned by Mariano Abeleda, Paluan, Mindoro.

These cattle sell at an average of ₱35 per head, weigh 650 to 700 pounds live weight, and 350 to 400 pounds dressed. I do not know how much they would sell for dressed as they are not marketed that way. These herds should produce for the market from 9,000 to 10,000 head per year, allowing

for deaths and the increase of the herds. The cattle owners here figure that each cow will produce three calves each two years.

The cattle on the west coast of Mindoro are practically free from disease.

Should the Government itself contemplate raising cattle for the use of the Army in the Philippines, there is a valley, public land, near the headwaters of the Caguray River which empties into Iling Strait, that will bear investigation. It is 20 miles back in the interior, and is inclosed by high walls so that 2 or 3 miles of fence at the mouth of the valley would completely close it in. The valley is 5 miles wide and 20 miles long. Cattle there could be kept absolutely free from disease, and trail could be cut over which they could be driven to the point near the mouth of the Caguray River, where there is from 60 to 80 feet of water 100 feet out from shore. The mouth of that river is at Iling Strait, a perfectly protected harbor at all seasons of the year.

I do not believe it would be practicable to attempt to bring cattle down the Caguray River by water transportation, although, with a little dredging, they might be brought for some miles in that way.

The enormous expense attending the establishing of Government cattle ranches for the raising of the Army's beef appears to this committee to be altogether beyond what it would be reasonable to advise. The committee is of the opinion that the raising of beef cattle in these Islands should properly be left to the civil stock raisers; that these men, properly encouraged by the Government authorities, will gradually invest, slowly and as disease becomes less and less a source of dread, and ultimately there may be beef here for sale to the Government, but for some years to come the continued purchase of the present Australian frozen meat, under the usual contract arrangements now existing, is believed to be the very best that can be done.

As this report is being concluded there comes a report of a new rinderpest outbreak in Mindanao, Davao District, the adjacent country being involved, and already the Bureau of Agriculture has dispatched veterinarians to that place to fight the disease. This territory is adjacent to that recommended by General Pershing's letter above.

(Signed) G. E. NESOM,

Director of Agriculture, Chairman of Beef Committee.

(Signed) D. L. BRAINARD,

Lieutenant-Colonel, D. C. G., U. S. Army,

Member of Beef Committee.

(Signed) C. R. KRAUTHOFF,

Major, Commissary Department, U. S. Army,

Member and Recorder Beef Committee.

Supplementary Beef Report.

In the investigations of this committee, an effort has been made to ascertain why the local beef dealers never bid for the Army beef supply, and it is found that the refrigerator steamers running between Australia and Manila are largely controlled by a local firm known as E. S. Yuill & Co. While these people do not own the steamers, they are such large importers that they control the freight space in almost every refrigerator steamer in this business, thus making it possible to bar out competition. The local firms that are willing to bid state that even if they secured the Army contract for Australian beef, this firm of Yuill & Co. would be able to cause them serious loss by their secure control of this freight space, and therefore all local dealers are forced to stand aside.

However, as shown in Table 5, two local firms are endeavoring to arrange their own refrigerator ships so as to be able to compete; one firm is Lack & Davis, who are preparing to put on their own refrigerator ships between Hongkong and Manila for the handling of Chinese beef, and as shown in Table 5 of this report, the Government would make an annual saving *at the start* of some \$118,000 gold per year if we changed to Chinese beef, this firm getting the contract. The other dealer who is also arranging to put on his own refrigerator ships between Australia and Manila is Lichauco of this city, who states that he hopes to have his ships running in about five or six months, when he will be prepared to bid for the Army beef, and expects to be able to quote a price, delivered here in Manila, of five cents gold per pound. Such competition will lower the present price to the extent of a saving to the Government of some \$269,800 gold per year, and causes this committee to feel still more convinced that it is to the advantage of the Government to continue to use the Australian beef.

(Signed) G. E. NESOM,

Director of Agriculture, Chairman.

(Signed) D. L. BRAINARD,

Lieutenant-Colonel, D. C. G., U. S. Army, Member.

(Signed) C. R. KRAUTHOFF,

Major, Commissary Department, U. S. Army, Member.

Supplementary Beef Report, No. 2.

1. Since the preparation of this general report on the beef subject, the following information has been furnished the board

by the Bureau of Agriculture and is therefore appended herewith for the information of this board:

Dr. G. E. Nesom, Director of Agriculture, expresses the view that this Archipelago is naturally a good grazing country, in many parts, and is at present without an adequate supply of cattle. He believes that their successful production will not be possible until animal diseases prevailing in these Islands now are under control. Dr. Nesom also informs the Board that the 2,936 head of native cattle received in Manila during the fiscal year 1909, represent the receipts of native cattle in the channels of trade; it is probable that another thousand head were shipped to Iloilo and Cebu for slaughter and still smaller numbers to such towns as Zamboanga, Albay, and Sorsogon; it seems safe to say, however, from Doctor Nesom's knowledge of this subject, that practically all of the beef cattle in the Philippine Islands, except about 5,000 head, are slaughtered for local consumption near where they are raised, and this number is impossible to obtain.

2. The Bureau of Agriculture has recently been making a census of the cattle and carabaos in these Islands, and has found that the total number, including all classes of cattle, excepting carabaos, is now 232,277 head, to which must be added an estimated 5 per cent to include animals which have not been reported, making a total at present of about say 243,891 head. Assuming 20 per cent as the maximum number of these cattle which might be considered as beef cattle, this would give at present some 48,778 head instead of the 36,668 estimated in this report. The fact still remains that the purchase of all of these beef cattle would stop breeding, use up all in the Islands, and kill the industry. Table 8 shows the census by provinces.

No.	Province.	Cattle.	No.	Province.	Cattle.
1	Agusan	311	21	Misamis	1,287
2	Albay	1,284	22	Moro	16,617
3	Ambos Camarines	1,373	23	Mountain	15,772
4	Antique	5,571	24	Nueva Ecija	3,051
5	Bataan	277	25	Nueva Vizcaya	623
6	Batangas	35,176	26	Occidental Negros	10,895
7	Bohol	6,549	27	Oriental Negros	3,779
8	Bulacan	1,344	28	Palawan	8,785
9	Cagayan	10,626	29	Pampanga	1,879
10	Capiz	8,115	30	Pangasinan	12,703
11	Cavite	3,110	31	Rizal	902
12	Cebu	11,107	32	Samar	1,408
13	Ilocos Norte	6,033	33	Sorsogon	6,046
14	Ilocos Sur	13,422	34	Surigao	491
15	Iloilo	6,198	35	Tarlac	1,370
16	Isabela	2,358	36	Tayabas	9,051
17	La Laguna	1,786	37	Zambales	1,869
18	La Union	4,024	38	City of Manila	389
19	Leyte	6,740			
20	Mindoro	9,953		Total	232,277

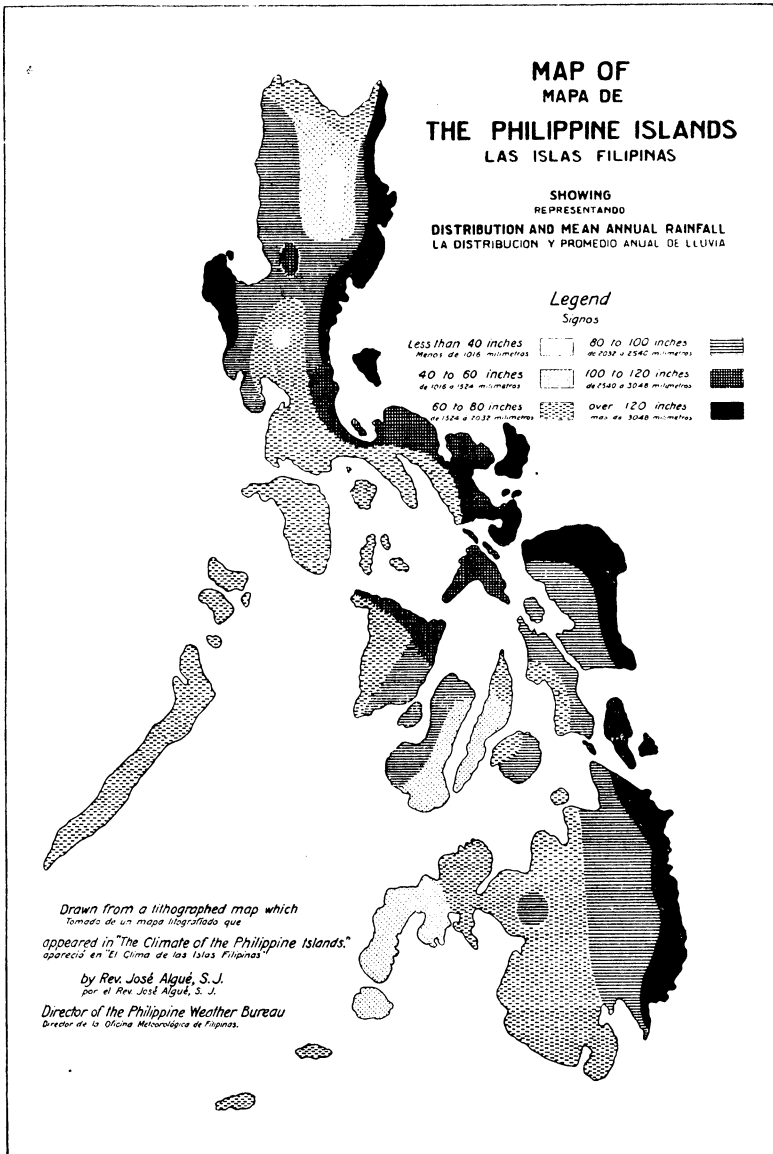


PLATE VII.

PART III.—THE PHILIPPINE ISLANDS AS A GRAZING COUNTRY.

An editorial appeared in the January, 1911, number of the PHILIPPINE AGRICULTURAL REVIEW entitled "A Conservation Policy for the Philippines." Among other things, this editorial points out that one of the greatest sources of natural wealth of these Islands is the unoccupied lands, for the most part unclaimed public domain which constitutes from 50 to 75 per cent of the area of the Philippine Islands, or about 40,000,000 acres. None of this land is occupied by commercial forests or used regularly for cultivation, and is for the most part grass land covered with cogon, tigbao, and other coarse tropical grasses which grow from 2 to 10 feet high, die down during the dry season and are burned off by the natives. A small percentage of this land is covered by a scrub forest and brush where the shade is dense enough to prevent the growth of grass as a consequence of the killing of the timber growth by fire. Nearly all of this unoccupied territory is suitable for cattle grazing, provided the herds are made up of the native, Chinese, or Hindu types of cattle. Experience has shown that the modern breeds of European or American cattle will not thrive on this grass. Where lands are not grazed the grasses grow to be very tall and coarse and their usefulness for pasture purposes is lessened. Constant and close grazing, mowing, and burning tends to produce a fresh, tender growth which is much more valuable for grazing purposes than the mature grass. Many of these lands are deficient in shade, and during the dry season there are many places where water is a little difficult to obtain. Shade can be easily provided by planting out the rapid growing tropical trees such as the acacia, eucalyptus, and narra. Wherever there is a scarcity of water it can usually be obtained by digging a ditch from some spring in the hills to convey the water out to accessible territory, and in the level lands good success has attended the boring of artesian wells. The great extent of this territory places the Philippines among the pioneer countries like Argentina, South Africa, and the southwestern portions of the United States a few years ago, and indicates that they are destined to remain logically a cattle-grazing country for many decades to come. During the last half of the past century the Philippines obtained quite a reputation for the number of cattle raised, although the unfortunate introduction of rinderpest into this country greatly restricted the stock business during the six to eight years preceding the revolution. The live-stock business

is considered, at the present time, an extra hazardous enterprise on account of the prevalence here of rinderpest and surra.

The very strong efforts now being put forth by the Insular Government through the Bureau of Agriculture for the complete eradication of these diseases may result in accomplishing the desired end, as has been done formerly with foot-and-mouth disease, but until these two diseases no longer exist here the live-stock business will not be a safe investment. The prospective investor will find no difficulty in locating large grazing areas in almost all parts of the Archipelago. There are many thousand acres as level as a table top well supplied with springs and skirts of timber in the Provinces of Bulacan, Pampanga, Nueva Ecija, Tarlac, and Pangasinan, but more particularly in Nueva Ecija. The whole Cagayan Valley, 30 or 40 miles wide and about 200 miles long, is available for grazing, with the exception of a little ribbon of tobacco land on the banks of the Cagayan River and its larger tributaries. There is excellent grazing land on the south coast of the Province of Tayabas. The Island of Burias was used by the Government for the cattle offered for sale to replace the animals which died of rinderpest soon after American occupation. It is now practically free from cattle. The Province of Agusan is one vast table-land. After leaving the coast a few miles it is covered with a growth of native grass, is generally open country, and is cut here and there by small cañons running from mountain to seashore. The Cotabato valley, extending from the mouth of the Cotabato River to Sarangani Bay is a vast grazing land and forest covering over 2,500 square miles. The Island of Jolo contains excellent grazing lands and they are scattered all over large and small islands of the southern group in great abundance. In the Island of Panay there is a strip of rolling clay hills along the line of the Manila Railway Company between Passi and Dumarao, which is unoccupied and better suited for grazing purposes than any other use. Cebu is a densely populated island with all available land suitable for agricultural purposes in cultivation. Palawan is an island with a rugged backbone of hills cut by many small valleys on either side in which stock raising is carried on to a limited extent, but the available territory is many times over that which is now occupied. The southwest coast of Mindoro, both ways from Mangarin Bay, is a noted grazing country which has supported many thousands of cattle.

It is not a question of available lands for grazing purposes but of restoring conditions which will make the live-stock busi-

ness reasonably safe, and adopting a policy which will enable a man in the grazing industry to occupy the many desirable places to be found all over the Philippines. For the present all such persons can be accommodated on the Islands of Luzon, Panay, Mindanao, and other parts where satisfactory transportation by boat or rail is available.

(Signed) G. E. NESOM,

Director of Agriculture, Chairman of Committee.

(Signed) D. L. BRAINARD,

Lieut. Colonel, Department Commissary General, Member.

(Signed) C. R. KRAUTHOFF,

Major, Commissary Department, U. S. Army, Member.

MANILA, P. I., *January 10, 1911.*

Pursuant to call of the president thereof, the board met in Manila at 3 o'clock p. m., this date.

Present: All of the members except Capt. J. L. Knowlton, quartermaster, United States Army, who was returning to the United States, under orders.

The board then proceeded to a careful consideration of the report of the committee appointed to investigate the subject of native beef.

After thoroughly discussing all points regarding the substitution of native beef for the present Australian beef, as well as the idea of establishing Government cattle ranches in these Islands for the raising of beef for the Army, the board was unanimous in its opinion that both schemes were impossible and impracticable at the present time and that a continuation of the present method of supply, by the purchase of the frozen Australian beef, was the best possible arrangement which can be made.

The board then adopted the report of the beef committee, in full, and directed that a copy of the report be forwarded to the Secretary of War, Washington, through the channel prescribed in the original order of the Secretary of War establishing the board.

There being no further business before the board, the board adjourned, at 5 p. m., to meet at the call of the president.

(Signed) NEWTON W. GILBERT,

Vice-Governor, Philippine Islands, President.

(Signed) JNO. J. BONIFACE,

Captain, Second Cavalry, Recorder.



(Photograph by O. W. Barrett.)

PLATE I.—DWARF COCONUT TREE, MISAMIS, MINDANAO.

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EDITORIAL.

RICE FAMINE.

The present shortage of rice, not only in the Philippines, but throughout the Far East, amounting as it does to practically a severe famine, ought to teach the Philippine people a lesson.

All the rice lands of the Philippines are more or less subject to damage by heavy rains and the consequent floods. If such rains and floods occur during the growing period of the paddy more or less damage is sure to result. A typhoon is not necessary to cause this wholesale destruction of growing rice, since any cause that changes the peculiar requirements of lowland rice—which forms, of course, the great bulk of the rice crop here—will produce the dire result.

Since damage from water can not be prevented and since the Philippine people are at present very dependent upon wetland rice for their standard food supply, the question arises, What should be done in case of failure of the Philippine rice crop? Leaving aside the commercial question of importing sufficient supplies to meet the domestic shortage we arrive at the simple conclusion of the difficulty—substitution of some other food for this. Custom, of course, plays a tremendously strong part in the habits of the people in the provinces and there is more or less physiological reason for some of their dietary habits, but the fact is, practically every individual, whether Tagalog, Visayan, Pangasinan, or of any other Filipino race, can live on a diet containing no rice whatever. In some localities a large part of the daily rations of the people is maize, and there is no doubt whatever that it could be and should be used much more than it now is by the peoples of the Archipelago. The trouble is that the average Philippine cook or housewife does not know how to properly prepare maize for human consumption; instead of thoroughly cooking it they are likely to treat it as they would rice, which, of course, requires only about one-half the amount of cooking that maize does. Beans, for the same reason, are by no means so commonly used as they should be among the Filipinos. When thoroughly cooked, beans are even more nutritious and supply certain important elements which are lacking in rice.

Wheat flour, mostly in the form of bread, is now a recognized feature of diet in a large percentage of the Philippine homes, but it might well be used to a much greater extent than at present.

Now is the most propitious time for the moving spirits in Philippine matters to urge upon the people the necessity of adopting a more varied form of diet, and in so doing to consider the various sides of the question thoroughly, remembering that while rice is a cheap and nutritious food it is by no means the only cheap food that may be produced abundantly in the Philippines, and that it is not to be considered as a *necessary* article of diet in any way in any locality. Even in the wet-land rice districts a crop of beans or corn, or, in many cases, a crop of each, could be raised on the same ground, which during the wet season is capable perhaps of producing nothing but rice. The inhabitants of the Cagayan Valley have come to realize that they must not place their reliance entirely upon tobacco to furnish them indirectly with food; and the sooner the inhabitants of the rice districts realize that they should not depend entirely upon rice for their food supply the better it will be for them physically as well as industrially.

The Bureau of Agriculture hopes this so-called "rice famine" will bring about the planting of a large amount of corn and beans in all the suitable areas throughout the Archipelago. It is an ill wind, indeed, which does not blow some good.

GENERAL ORDER NO. 1, IMPORTATION OF CATTLE
FROM AUSTRALIA, TASMANIA, AND NEW
ZEALAND.

By the DIRECTOR OF AGRICULTURE.

MANILA, P. I., *July 11, 1911.*

On and after date, dairy and breeding cattle from Australia may be landed at ports in the Philippine Islands when accompanied by a certificate of health and origin containing information as to the following facts:

The certificate will contain the statement of the owner, describing the animal as to breed, color, age, sex, brands, place of birth, and information as to all locations up to date of departure. The owner will declare under oath that the above information furnished by him is true and that the animal has never suffered with contagious pleuro-pneumonia nor been in contact with animals so affected.

The certificate of health and origin will further contain information certified by the chief federal quarantine officer of the State of Australia from which the cattle were embarked, as to the following facts:

(a) That the animal above described has always been in a closely settled district or districts in which the conditions as regards animal disease have been constantly and exactly known by the department of agriculture.

(b) That the animal has not during the twelve months next preceding the date of issue of the certificate suffered from or been in contact with any animal suffering from any contagious disease (tuberculosis possibly excepted) and has never been in any district in which contagious pleuro-pneumonia existed at the time.

(c) That the animal was submitted to the tuberculin test by _____, federal quarantine officer, and a satisfactory negative reaction was obtained. A complete record of the temperatures of all of the animals tested, date of test, etc., is attached.

(d) That the animal is being shipped by the steamer _____ sailing from _____ on _____

(e) That the fodder supplied for use on the voyage has not been exposed to infection of contagious pleuro-pneumonia.

(f) That he has ascertained from an official source that the vessel in question has not transported on the last voyage, cattle not accompanied by a certificate similar to this, or if such cattle have been transported, he will certify that the vessel has since been properly disinfected.

Cattle so certified will be marked with a special brand by a qualified official in Australia, and cattle not so branded and certified, will be refused landing in the Philippine Islands except for slaughter at Sisiman.

Cattle accompanied by certificate may be refused landing in the Philippine Islands except for slaughter if they have been transported from Australian ports in vessels that have transported cattle not so certified during the same trip or on previous trips without the vessel having been disinfected since to the satisfaction of a properly authorized representative of the Commonwealth of Australia or of the Government of the Philippine Islands.

Dairy and breeding cattle from Tasmania and New Zealand will be allowed to land in ports of the Philippine Islands when accompanied by a certificate from the local federal quarantine officer of the Australian port where transshipped, to the effect that the animals were kept under Government supervision during transshipment and were not exposed to infection of contagious pleuro-pneumonia. Such dairy and breeding stock from Tasmania and New Zealand will be allowed to land in the Philippine Islands only when transported from Australia under the conditions above specified for such stock of Australian origin. Such cattle from New Zealand must be accompanied by a certificate from the department of agriculture to the effect that the Dominion is wholly free from contagious pleuro-pneumonia, that the animals have been tested with tuberculin with negative results, and that the ship has been thoroughly disinfected if it has transported infected cattle previously. A complete record of the temperatures of all the animals tested, date of test, etc., will be attached to the certificate.

All certificates accompanying cattle from Australia will be addressed to the Director of Agriculture, Manila, in care of the master of the vessel transporting them.

G. E. NESOM,
Director of Agriculture.

Approved:

W. CAMERON FORBES,
Acting Secretary of Public Instruction.

**GENERAL ORDER NO. 2, REGULATIONS GOVERNING
THE IMPORTATION OF BEEF ANIMALS FROM
AUSTRALIA WHEN DESIGNED FOR
SLAUGHTER.**

By the DIRECTOR OF AGRICULTURE.

MANILA, P. I., July 26, 1911.

1. Cattle embarked at Australian ports, except as provided in General Order No. 1, series 1911-12, dated July 11, 1911, may, after July 26, 1911, be discharged and landed for slaughter only at the stock yards of the Bureau of Agriculture at Sisiman Bay, Province of Bataan, and nowhere else in the Philippine Islands.

2. Proper entry of the vessel will be made with the Collector of Customs in Manila before any cargo can be discharged. The usual inspection of the imported cattle will be made by a representative of the Director of Agriculture and the regular inspection fee of 20 centavos a head will be charged.

3. Owners of live stock will unload, drive, feed, and butcher cattle *besides being responsible for transporting the meat to Manila. The conditions under which the meat is kept during transportation shall be satisfactory to the Director of Agriculture, but the owner shall not be relieved of the responsibility of landing meat in Manila in a wholesome condition, conforming to food-inspection requirements.* All dead animals, condemned carcasses, and parts, will be disposed of by the Director of Agriculture, with the reservation that the owner be responsible for disposing of dead animals pending the installation of suitable apparatus for disposing of same.

4. The superintendent of the Sisiman stock yards and matadero will have charge of all operations carried on therein, including the general system of butchering and dressing. There will be charged a fee for slaughtering animals amounting to 3 centavos per kilo of dressed meat, including livers, hearts, and tongues removed for sale or consumption, but no fees will be

collected on condemned meat. Each piece of meat will be weighed by the superintendent and marked with tags showing the weight, together with the name and address of consignee if so desired by the owner. The superintendent will make a daily statement showing the number of pieces, weight of each, and gross weight of meat removed by each owner, forwarding the same daily direct to the Collector of Internal Revenue, and duplicate copy to the Director of Agriculture.

5. Within thirty days after slaughter begins, the Collector of Internal Revenue and Director of Agriculture will ascertain the cost from meat owners for transporting meat from Sisiman to Manila, or arbitrarily fix the sum, and the Collector of Internal Revenue will rebate this amount from the total fee of 3 centavos per kilo for dressed meat. The rebate shall be wholly within the discretion of the Collector of Internal Revenue and the Director of Agriculture to change from time to time without notice as they shall see fit, and every person, firm, or corporation using the matadero accepts this condition; provided, however, that such rebate shall be contemporaneously equal for all persons at all times; and provided further, that at no time shall it exceed the lowest cost incurred by any user of the matadero for transportation to Manila, nor in any event the cost at which, in the estimation of the Director of Navigation, the Government could render such service. Books of account shall be opened for inspection in connection with ascertaining cost of transporting meat from Sisiman to Manila. Fees shall be collected in such manner and at such time as may be determined by the Collector of Internal Revenue.

If two or more persons or firms are engaged in the slaughter of animals in the Sisiman matadero all meat shall be transported to Manila in one vessel in accordance with arrangements to be made between the principals. Upon failure of the principals to agree as to charges, etc., for such transportation, the Director of Agriculture may take over the transportation of meat from the matadero to Manila, in which case no rebate for transportation will be allowed and owners of meat will be required to pay the actual cost to the Bureau of Agriculture for such transportation.

6. Meat shall be discharged at a point on the Pasig River designated by the Collector of Customs and further delivery will be made in exactly the same manner as meat is delivered from the Manila matadero to various parts of the city, the owner paying the usual transportation fees to the city of Manila.

7. The Director of Agriculture reserves the right to make a slight charge for yarding cattle, to cover cost of water, labor,

police, superintendence, deterioration, etc., as soon as it is possible to determine same.

8. The Director of Agriculture reserves the right to slaughter at Sisiman any cattle diseased or exposed to disease when, in his judgment, this is necessary to protect the live-stock interests of the Philippine Islands in general. In such event all precautions possible will be observed to prevent losses from infectious diseases of cattle, but the Government of the Philippine Islands disclaims all responsibility for such losses from cattle diseases.

9. General Order No. 16, dated July 19, 1910, is hereby repealed.

G. E. NESOM,
Director of Agriculture.

Approved:

W. CAMERON FORBES,
Acting Secretary of Public Instruction.

LAWN GRASSES IN THE PHILIPPINES.

By C. V. PIPER,

Agrostologist, United States Department of Agriculture.

The growing of satisfactory lawns in the Philippines presents no special difficulties, but inquiries concerning the making of lawns are frequent. In the preparing of a lawn the land should be thoroughly worked by plowing and harrowing until the land is in fine tilth. In the United States most lawns are planted by the sowing of seeds, a method not applicable with the grasses most valuable in the Philippines. These grasses are Bermuda grass, Korean grass, St. Augustine grass, and Lippia, all of which are best planted from roots or runners. In making a small lawn with any of these grasses it suffices to plant small pieces of the plant in rows about one foot apart and the plants a foot apart in the rows. With such planting, under favorable conditions, the ground should be completely covered with the grass in from thirty to sixty days. In case the desired lawn is large, it is greater economy to cut up the Bermuda or other sod in small pieces by running it through a feed cutter, scattering the pieces broadcast over the newly harrowed ground and then rolling. Care should always be taken to have the lawn fairly well drained, as otherwise nut grasses and other plants which grow in wet places will occupy the ground.

Bermuda grass.—Bermuda grass is the most common lawn grass used in the Philippines; most of the extensive lawns about Manila have been planted with this grass. The method used is to plant it in rows about a foot apart and the plants about 4 inches apart in the rows. Bermuda grass makes a very satisfactory lawn. The variety growing in the Philippines is apparently different from the common form in the southern United States, in that it does not grow so tall. One other variety, known in Florida as St. Lucie grass, differs from ordinary Bermuda in that the stolons are underground instead of on the surface as in ordinary Bermuda. This form does not seem to occur in the Philippines, but may have advantages.

Korean grass.—This is a native grass growing near the seashore throughout the Philippine Islands. Excepting in the flowering head, it closely resembles Bermuda, but the leaves are of a paler green color. Near the seashore, at least, Korean grass is more aggressive than Bermuda grass, which it will crowd out in time. At the present date 90 per cent of the grass on the Luneta is Korean grass, although it is stated that this lawn was originally planted in Bermuda. Bermuda grass will apparently cover the ground more rapidly than Korean so that it seems advisable to plant lawns, when near the seashore, with Bermuda, even if the Korean crowds it out later.

In the United States Korean grass withstands the winter as far north as Connecticut, considerably farther north than the limit of Bermuda, thus indicating that the Korean grass is more hardy. It is not known how Korean grass will succeed in the Philippines away from the seashore, especially at high altitudes, but experiments are now being conducted with it at Baguio.

St. Augustine grass.—This is a coarser grass than Bermuda and the foliage is pale, like Korean grass; it is propagated in the same way, namely, by runners. In Florida it has been found to be a very satisfactory lawn grass in shady places and in very sandy soil. Plants of it growing at the Singalong experiment station show that it is perfectly at home in the Philippines. It is not to be recommended, however, where Bermuda or Korean succeed satisfactorily.

Lippia.—This is a small-leaved creeping plant much used in California as a lawn plant. A coarser-leaved variety is native in the Philippines. At the Singalong experiment station the California Lippia succeeds admirably and it is likely to prove very useful here, especially in situations where the other grasses will not succeed. It is a very low-growing plant with small heads of whitish flowers; so close to the ground that it rarely needs mowing; in fact, lawns of it can be allowed to go indefinitely without mowing.

Desmodium triflorum.—This is a native Philippine plant which grows very close to the ground, rarely exceeding 3 inches in height and usually shorter. In a general way it resembles white clover but the leaves are much smaller. Single plants will frequently make a circular mat 2 feet in diameter, the runners rooting at the nodes. In the West Indies pure lawns are sometimes made of this plant, but none have been seen in the Philippines. The *Desmodium*, however, finds its way into all grass lawns, growing among the grass without destroying it. On the Luneta the circular mats which it makes are very conspicuous because its

foliage is so much darker green than the grass. Except for this feature it is a desirable constituent of lawns. Where the lawn is Bermuda the colors are so nearly alike that the *Desmodium* is rarely noticeable.

Weeds.—The greatest trouble with lawns in the Philippines is the ingress of weedy grasses. Perhaps the most troublesome of these is nut grass, especially in wet ground. The leaves of this are fine, however, and in itself does not make a bad lawn. Mixed with Bermuda, or other grass, however, the contrast in the leaves is not pleasing. A few other coarse-leaved grasses occur commonly as weeds, and the only thing to do with these is to remove them bodily, preferably by cutting out the piece of sod and replacing with new sod. Chemical sprays, especially of sulphate of iron, are now used in Europe and the United States to destroy certain weeds in lawns. This can only be done where a strength of the solution can be found which will destroy the weeds without injuring the lawn grass. It is doubtful, however, if this can be made successful with either nut grass or the other weedy grasses which commonly grow in the Philippine Islands.

THE IMPORTATION OF CATTLE FROM AUSTRALIA.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

The difficulties of controlling infectious animal diseases in the Philippines are greatly increased by the necessity of importing beef on the hoof. Filipinos demand freshly slaughtered beef, which commands a higher price than cold-storage beef, against which there is a strong prejudice. An unlimited amount of frozen beef is available for the foreign population of Manila, but this is not a factor which satisfies the requirements of the Filipinos.

The ravages of cattle diseases have made native beef scarce, hence, the necessity of importation. Somewhat over a year ago China and Indo-China furnished this supply of beef for Manila and near-by municipalities, but the requirements for combating animal diseases necessitated the application of restrictions against importation from China. These were so strict as to be practically prohibitive, and since then measures have been so strengthened as to make them absolutely so. These measures were the result of the experience of a decade in which it had been demonstrated that shipments of cattle from the China coast introduced foot-and-mouth disease and rinderpest with alarming frequency. The result of these restrictions gave Indo-China practically a monopoly in supplying beef cattle, and this consideration alone was a strong incentive to opening trade with Australia. The Philippines constitute a closer market to the stockmen of northern Australia than do the ports of southern Australia. Under these conditions northern Australia competed actively with Indo-China.

Importations from Australia had hardly begun when contagious pleuro-pneumonia was discovered at the matadero where these animals were slaughtered. This disease, owing to its insidious nature, is second only to rinderpest as a menace to the cattle industry of the Philippines, and necessitated prompt measures to prevent further exposure of our animals to the infection. The exclusion of Australian live cattle was neces-

sitated by reason of the lack of proper facilities for safely handling them in Manila. Under the conditions existing at the time it was necessary to drive the cattle from the water front to the owners' corrals scattered throughout the heart of the city. From these corrals they were of necessity driven through the open streets again to the Manila matadero. A few months later, when the construction of the Pandacan quarantine station had progressed far enough to permit occupancy by cattle, the situation was somewhat improved, but not enough to warrant allowing the importation of Australian cattle. The location of the quarantine station on the Pasig River permitted transportation direct to it from the ships by water. The danger of transmitting contagious pleuro-pneumonia was such that it was not deemed safe to allow Australian cattle in the quarantine station where they might infect animals destined for the provinces.

The prohibition of the admission of animals from Australia resulted in depriving Manila of its best source of supply of dairy cattle. Since this occurred, no dairy cattle from any source have been introduced into Manila, and the situation became very serious in view of the fact that dairy cows do not prosper in this city, and must be frequently replaced.

These conditions indicated the desirability of a most searching investigation of the animal disease conditions in Australia. Accordingly, Dr. Frank C. Gearhart sailed on July 30, 1910, for Australia, with instructions as follows:

You are hereby directed to proceed by first available transportation to Australia, and to visit all the principal States and ports thereof, for the purpose of investigating the conditions that prevail with reference to dangerous, communicable animal diseases.

This Bureau sincerely regrets that the recent importation of contagious pleuro-pneumonia (lung plague) has made it necessary to regard the importation of Australian cattle as dangerous.

The principal feature of your mission will be to determine the possibility of our obtaining healthy Australian cattle for immediate slaughter, and to determine to what extent the Australian Government, or the governments of the several States, are able to coöperate in this matter.

You will please determine from official sources, and otherwise, the distribution of contagious pleuro-pneumonia, and ascertain from what ports, if any, we may obtain clean cattle. You will please ascertain the extent to which the Inspector under the live-stock and meat export act of 1895 makes inquiry as to the state of health of live stock before certifying them as sound and free from disease.

I am handing you herewith copies of official correspondence and cablegrams relating to recent experiences with infected shipments from the port of Wyndham, West Australia, together with specimens of the lungs of such infected cattle. You may use these as the circumstances at the time seem to dictate, but in any event, before leaving, transmit to the Federal

Government of Australia the specimens together with copy of the telegram from the chief inspector of stock, dated Perth, July 22, 1910, and that from Mr. Baker, vice consul-general, dated Sydney, July 25, 1910, together with such papers as show our opinion as to the nature of the disease.

I would suggest that, if you have reason to believe there is a port from which we can get clean cattle, properly certified by the Government, you cable that fact.

Please render reports regarding the progress of your investigations as often as mail facilities permit.

I would suggest that you get copies of the books containing registry of brands of the different States of Australia.

Doctor Gearhart spent several months in Australia, Tasmania, and New Zealand. On his return he prepared an admirable report upon his investigations. Reduced to the shortest possible statement, his report showed that nowhere in Australia could there be obtained range beef cattle absolutely free from the danger of contagious pleuro-pneumonia. Dairy and breeding stock could be safely imported under very strict precautions, exercised with the assistance of the officials of the department of trade and customs of the Commonwealth of Australia. He received the most courteous attention from the Australian officials, who admitted the existence of the disease with the greatest frankness, and rendered him hearty assistance in his investigations.

From Doctor Gearhart's report it was concluded that if Australian beef cattle were to be imported for slaughter this must be done under conditions reducing to a minimum the danger of infection of local cattle with contagious pleuro-pneumonia. That no such facilities existed in Manila has already been pointed out. Owing to the absence of convenient and safe arrangements for importing and slaughtering cattle, Manila has earned the just reputation of being the plague spot of animal pestilences and the fountain-head of animal diseases in the Philippines. Obviously, the addition of another disease to those already common in the port would be a step backward. The urgent solicitation of would-be importers of Australian cattle, as well as the courteously expressed desire of the officials of the Australian Commonwealth—not to mention the demand for cheap fresh meat—pointed to the desirability of securing facilities in some place near Manila where the importation of animals for immediate slaughter could be allowed.

Through the courtesy of General J. Franklin Bell, negotiations were opened with the War Department, at Washington, with the view of obtaining a site for stock yards and matadero somewhere within the Mariveles military reservation.

His Excellency the Governor-General, by Executive Order No. 25 (series 1911), appointed a committee consisting of Mr. Ellis Cromwell, Collector of Internal Revenue; Mr. Fred M. James, chief of the division of sanitation and transportation, city of Manila, together with the writer, for the purpose of considering a site. The committee was charged with the duty of coöperating with the representatives of the Commanding General, Philippines Division, agreeing upon a location for the matadero, and preparing alternate plans for the construction and operation of such matadero; first, as a private enterprise; and second, as a Government institution. In company with the board appointed by the Commanding General, which consisted of Major Chamberlain, Captain Prentice, and Lieutenant Booth, a visit was made to Sisiman Bay and a site satisfactory to all parties was selected. A suitable piece of land approximately 304 by 365 meters was reserved near the barrio of Sisiman on the bay of that name, near the stone quarry of the Atlantic, Gulf and Pacific Company. This site for the stock yards is connected with the water front by a strip of land sufficiently wide to provide access thereto and to provide a site for the matadero on the beach. The bay offers excellent harbor facilities for discharging cattle and is so located as to afford protection against prevailing winds. The committee appointed by His Excellency the Governor-General recommended that the stock yards and matadero be constructed by the Government and be run as a strictly Government enterprise. This arrangement absolutely assured equal terms to all importers of cattle from Australia and was adopted notwithstanding the fact that one importer offered to construct the necessary yards and buildings at his own expense. The committee further recommended that the fees for slaughtering animals at Sisiman Bay should be the same as those imposed in the city of Manila, in order that there be no discrimination against Manila in the matter of the municipal matadero fee of 3 centavos per kilo. It was further recommended that the importers of meat be responsible for the transportation of same from Sisiman Bay to Manila, in view of the possible disputes that might arise as to whether or not it would be safe to navigate Manila Bay on certain days during the typhoon season.

In order to permit the resumption of the importation of cattle from Australia for slaughter, General Order No. 2, series 1911-12, appearing on page 534 of this number of the REVIEW, was issued.

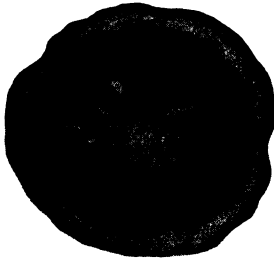
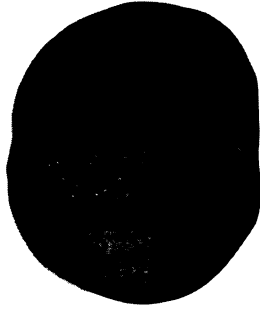
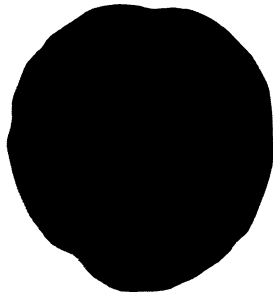
In view of the great urgency of the demand for fresh meat, the construction of the plant was begun by the Bureau of Public

Works under rush orders, and the shipment of cattle from Australia was timed with reference to their arrival at Sisiman at the earliest practicable moment that corral space would be available for them. In the absence of the matadero, which was in course of construction, for a few weeks slaughter was carried on on board a lighter. At the present time the whole plant, with the exception of a wharf, is completed and in operation.

There are two corrals about 101 by 244 meters, subdivided into smaller areas, and provided with tank, watering troughs, feeding sheds, and storehouse for fodder. The corrals, situated some little distance from the shore of Sisiman Bay, behind the barrio of Sisiman, are connected with the water front by a lane. The whole area occupied by cattle is surrounded at a distance of 30 meters by a barbed-wire fence, sufficiently strong to keep out wild animals. The matadero, 15 by 42 meters, with cement floor, is situated on the beach. Cattle are discharged from the ship by swimming and are guided to the shore by two lines of floating logs, fastened end to end, which act as a fence. The completion of a pier will enable the cattle to be discharged by means of lighters if this is found to be more desirable.

During the first month of operation 923 head of cattle were slaughtered. On one occasion, one day's kill of meat was spoiled because typhoon weather prevented the steamer from going after the meat.

In accordance with information gathered by Doctor Gearhart in Australia, and in accordance with arrangements made by him with the Australian Government, it was deemed safe to permit importation of Australian breeding and dairy cattle under the terms prescribed in General Order No. 1, which appears on page 532. This has made possible the establishment of dairies in Manila provided the managers succeed in avoiding the many perils which threaten such enterprises in the Philippines.



(Photograph by O. W. Barrett.)
PLATE II.—“SUÁ” (*Citrus* sp.).

TROPICAL FRUITS IN THE VISAYAS.

By P. J. WESTER, *Horticulturist*.

During the spring campaign against rinderpest, the Philippines Coast Guard cutter *Luzon* was placed at the disposal of the Bureau of Agriculture for a trip to the southern islands, the vessel being scheduled to touch at several points which are difficult of access by the regular steamer lines. Recognizing the unusual opportunity to get a horticultural "bird's-eye-view" of the islands to the south of Luzon, the Director of the Bureau instructed the writer to accompany him during part of the trip, for the purpose of collecting data on the status of fruit growing at the points visited, and to obtain some information relative to the comparative richness of the pomological flora in these islands. The object in this was to enable the Bureau to determine where horticultural exploration work may be prosecuted most profitably in this part of the Archipelago in the future, and to plan for such other work as would tend to encourage a more general cultivation of better varieties of fruits than are now grown. The party consisted of Dr. G. E. Nesom, Director of Agriculture; Messrs. O. W. Barrett, chief of the division of experiment stations; M. M. Saleeby, fiber expert; D. B. Mackie, agricultural inspector; C. V. Piper, Agrostologist of the Bureau of Plant Industry, United States Department of Agriculture; Mrs. Piper, and the writer. The *Luzon* left Manila, April 15 and arrived at Cebu the 17th.

Short trips were made, by land, from Cebu to Danao, Carmen, Argao, and Carcar, from which place the other members of the party proceeded across Cebu to Barili to meet Doctor Nesom on the *Luzon*. Returning from Barili to Cebu to coal, stops were made at Bosac and Bais, Oriental Negros.

The itinerary from Cebu to Tacloban, Leyte, included stops at Dapitan, Zamboanga; Oroquieta and Misamis, Misamis; Camp Overton, Zamboanga, from which place a visit was made, overland, to Iligan; Cagayan, and Mambajao, Misamis; Butuan and

Cabadbaran, Agusan; and Surigao, Surigao, at which points stops were made of longer or shorter duration. An interesting day was spent in Tacloban and vicinity, after which the steamer proceeded to Catbalogan, Samar, and to Pulupandan, Occidental Negros, where the *Luzon* was dismissed. Three days were consumed at the Bureau's experiment station in La Carlota, Occidental Negros, after which the party proceeded to Iloilo on a small interisland steamer. After a six days' stay in Iloilo, devoted to exploration trips in the surrounding country, including a journey to Capiz by rail, Messrs. O. W. Barrett, M. M. Saleeby, D. B. Mackie, and the writer returned to Manila, May 11. The trip was attended by most favorable weather conditions.

The interisland voyage, with its beautiful and ever changing scenery, the islands covered with a tropical vegetation that speaks volumes for the wealth of the soil, was a revelation to the writer and the source of great pleasure and unmingled enjoyment. Were it not for the remoteness of the Philippines from western civilization the inland sea of the Archipelago would long ago have been one of the beaten paths of the tourist. He daily invades new territory and the writer ventures to predict that no sooner do the beauties of the interisland voyage become better known than it will be one of the tourist routes of the world.

But, if the natural beauty of the Islands compels one's admiration and the signs of the latent agricultural resources fill one with wonder, the failure of the inhabitants, at large, to more than eke out a bare living and the crude methods employed in the culture of the main crops of the Islands and the conversion of the natural products into food, or into articles of commerce, show the backward condition of the development of the Islands and their industries no less strikingly, and to those who have seen the resulting prosperity in other parts of the world of the same industries properly developed, there is a vision of the wealth and prosperity that is due when the Philippines once come into their own.

Fruits are abundant throughout the year in the tropics, or should be, but there is a distinct lull here in the fruiting season between April 1 and May 15, the season of the citrus fruits, the orange, tangerine, and pomelo has closed; the lime and lemon have not yet reached maturity; a limited number of mangos are found in the market, commanding good prices, but the bulk does not arrive until late in May and June; only a few belated custard apples are in evidence and the sugar apple is only just in bloom. The soursop is the only cultivated species

of the genus *Anona* that matures fruits during all seasons of the year, and they are, during the spring, only sparingly produced. The guava is mainly a summer fruit, and excepting the macopa, which is now ripening its fruits, and the early fruit of the duhat, also in season about May 1, the other related species, the yambo and pitanga, ripen their fruits later. The cashew is at its best and a few chicos are marketed, but they mature mainly during the summer; the lanzones do not ripen until in the autumn, and the jack, as well as the nearly related breadfruit, are mostly only half grown. The banana, of which fruits of the various varieties are found in the markets in the different towns in the Archipelago at all seasons of the year, is an exception as is also the papaya.

For this reason very little opportunity was given on the trip to test many of the fruits that grow in the Philippines, and to reach a conclusion as to the merit of the different parts of the Islands for the production of certain fruits. In fact it is very doubtful if the results of such a test would accurately indicate the adaptability of certain fruits to one locality or that another is unfavorable for its production, this for the reason that no intelligent care is accorded the fruit trees; presumably little attention is paid to selection in planting seed, and budding and grafting are unknown. Fruit growing, as an industry, can scarcely be said to exist; the fruit trees are growing, a few of each kind, about the houses of the inhabitants, invariably set too close or planted along the roadsides or edges of the rice fields, on hillsides or in ravines, where the land is untillable. The writer obviously did not have the opportunity to see all there was in the islands visited, but the notation of only one regularly planted fruit orchard seen during the trip probably well illustrates the condition of the fruit industry in the Philippines.

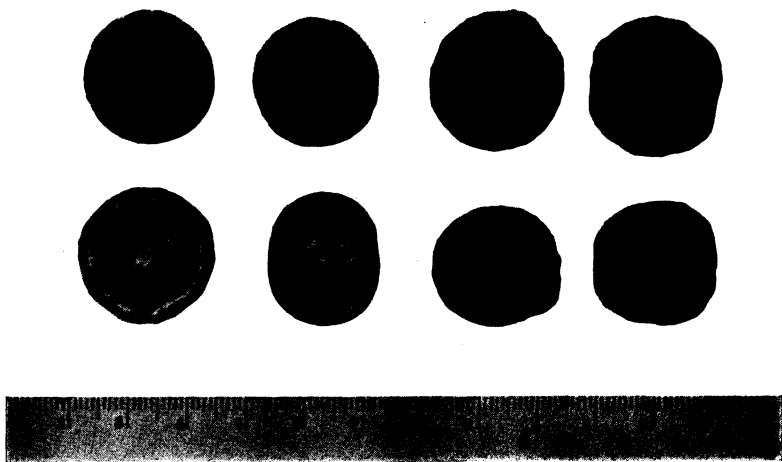
The only fruit tree whose product forms a staple article of export from the Philippines is the coconut (*Cocos nucifera*) and there are probably few towns in the Archipelago on the seaboard where this tree is not planted. The itinerary of the trip did not include any point where the growing of coconuts is an industry of importance, but small groves were passed, here and there, on the road from Cebu to Carmen and also seen in Dapitan, Cabadbaran, and Iloilo. The trees do not produce to the full extent of their capacity on account of too close planting. Barring the presence of the coconut beetle the trees appear to be remarkably free from insect pests. The coconut does not usually produce fruit until the trees are 7 to 8 years old, but a peculiar dwarf variety was met with in Misamis that is claimed to fruit

when only 4 years old. (See Plate I.) The fruits are considerably smaller than the ordinary nut, with a somewhat thicker flesh.

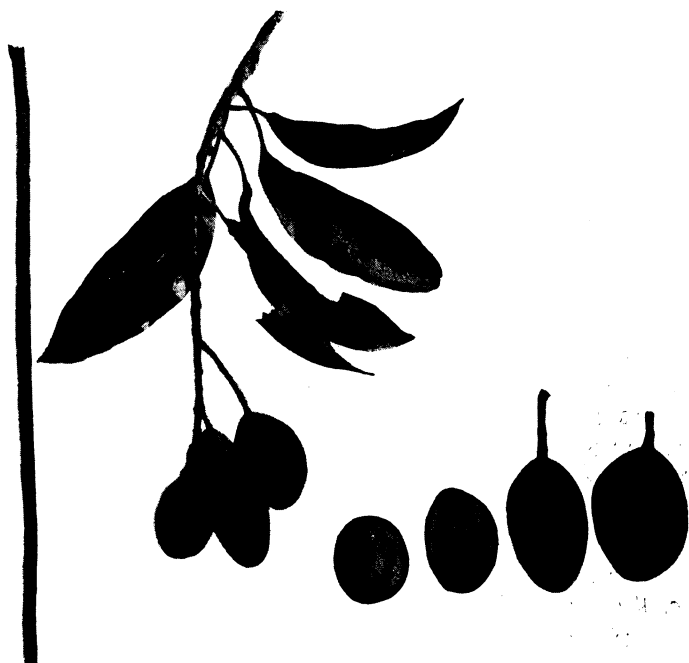
Cacao (*Theobroma cacao*), so important a crop in certain parts of the tropics, has never developed to an industry in the Philippines, and yet some parts of the Archipelago are undoubtedly well adapted to its culture. The cacao requires, to succeed, somewhat more attention than is bestowed upon fruit trees by the average planter in the Philippines, and this was well attested by the appearance of the specimens, seen here and there during the trip.

The banana (*Musa* spp.) is found universally planted in all places that have been visited. The house is indeed rare, in the yard of which does not grow one or more clumps of bananas, but those grown are mostly inferior varieties. It is a remarkable fact that in only two places, Iloilo and the near-by town of Jaro, there were found in the markets fruits of the "Chinese dwarf," a variety that has no superior in the Philippines and is one of the best varieties in existence. Aside from the superior quality of its fruit, and its greater productivity than that of the kinds usually planted, the dwarf habit of the plant, enabling it to better withstand the violence of the typhoons than the varieties commonly grown, should recommend it to the planter.

Of the citrus fruits, the pomelo, or "lucban" (*Citrus decumana*), the tangerine, or "narangita" (*Citrus nobilis*), the "cabuyao" (*Citrus torosa*), the orange, or "cajel" (*Citrus aurantium*), the lemon, or "limón" (*Citrus limonum*), and lime, also called "limón" (*Citrus limetta*), are planted with frequency in the order enumerated; the pomelo is found about evenly distributed in the points visited and invariably the trees observed were vigorous and thrifty, considering the absence of care and attention; two types exist one white fleshed and one whose flesh is more or less pinkish, with an exceedingly great variation in form, from roundish oblate to a very distinctly pyriform fruit; the presence or absence of pubescence noted on the young twigs of the trees of this species is probably correlated to other distinctive characteristics in the fruit. The tangerine is somewhat less extensively planted than the pomelo. This species was found in greater numbers in Tacloban, Palo, and Tanauan, Leyte, than at any other point. Samples of the fruit were obtained only at Mambajao, those being markedly larger than tangerines generally found in the market in Manila, and of fairly good quality. Wherever trees of this species were observed they appeared to be perfectly at home. Next to the



(a)



(b)

PLATE III.—(a) "SAMUYAO" (*Citrus* sp.). (b) "PANGI" (*Mangifera* sp.).

tangerine, the cabuyao seems to have a place in the affections of the native population. This is a very vigorous tree and, while the fruit seems to be of little value, it may, on trial, prove to be a very desirable stock for the cultivated species. The lemon is planted rather rarely and to a less degree the orange; the lime is but seldom seen and the citron exists only in the gardens of the more well-to-do. In Tacloban, Leyte, and Catbalogan, Samar, excellent fruits of the calamondin (*Citrus mitis*) were obtained, juicy and pleasantly acid. This fruit, under cultivation, might develop to a very good "ade" fruit, but it is now very little grown. A fruit called "suâ", used by the natives in cleaning clothes, was offered in the markets of Cebu and Tacloban and it was also seen in Misamis. The fruit is very distinct from all other citrus fruits and is best described as a small, oblately flattened citron, prominently ribbed longitudinally, and is possibly a variety of *Citrus medica*; it appears to be almost unknown outside the Visayas. (See plate II.) The samuyao is an unidentified, small, round, citrus fruit with a wrinkled surface and a conspicuous dent at the apex, about 25 millimeters in diameter, found in the market of Cebu, also very distinct in appearance from other known citrus fruits; it is used by the Filipino women in washing their hair and in making a pomade.

Perhaps nothing illustrates better the condition of the citrus industry in the Philippines than the fact that California oranges are sold, not only in Manila, but in Iloilo and Cebu. In these places, as well as in the small town of Catbalogan in Samar, Sicily lemons were for sale in grocery stores, and yet there is scarcely room for doubt that good lemons can be cheaply produced in the Islands.

Considering the attention they receive, the citrus trees in all parts of the Archipelago appear to be thrifty, vigorous, and free from scale insects to a remarkable degree. With the introduction of scientific methods of culture, Porto Rico, having a climate similar to that of the Philippines, produces a very superior orange and pomelo, and it seems, therefore, reasonable to believe that the orange, as well as the other citrus fruits, may in the future not only be produced here for home consumption, but also for export to Japan, Australia, and the mainland of Asia.

The mango (*Mangifera indica*), so extensively grown in several provinces in Luzon, is rather sparingly planted in the southern islands. No trees of this species were seen in Catbalogan, though they are probably planted farther inland, and there were notably few in Tacloban, otherwise so rich in fruits, and at several other points. Even in Cebu the mango is not planted as extensively as

in certain districts in Nueva Ecija, Bulacan, and Cavite, though Cebu mangos form an article of export during the fruiting season. The mangos examined in Cebu were of the same general character as the carabao variety in Luzon and fully equal to them in flavor and quality. Seemingly perfectly at home on the eastern shore of Cebu, the almost total absence of the mango in the interior, in going from Carcar to Barili, was striking. The neighboring island, Bohol, is said to produce considerable quantities of mangos. Mango trees of the type referred to are scattered through the country around Iloilo and adjacent towns and are seen here and there from the railway going from Iloilo to Capiz on the north shore of Panay. The general character of the mango trees in Dapitan would seem to imply that they are a type different from those noted elsewhere in the Philippines. In the market of Cagayan, mangos of the type known as "pahutan" in Cavite, were sold under the name of "paho." The "pangi" mango, an unidentified relative of *Mangifera indica*, of which a few specimens were obtained in Iloilo, is a tall upright-growing tree with comparatively smooth trunk and small, greenish fruits, the pulp very resinous and distinctly flavored, gelatinous, rather fibrous and having a large seed. Experiments may show this to be a desirable stock for the mango, but the fruit does not seem to possess any characteristics that might, to advantage, be imparted to the mango by hybridizing the two species.

The breadfruit (*Artocarpus* spp.) is very generally grown in Tacloban and the places visited in Occidental Negros and Iloilo; in fact, it appears to grow wild along the roadsides. It grows luxuriantly in the Visayas wherever planted, but is not generally grown except in the places mentioned. However, the trees appear to be almost exclusively of the poorer kinds that are propagated from seed, the natives evidently not knowing how to propagate the seedless variety. It is probably safe to say that the introduction of the twenty or more Polynesian varieties into the Philippines would prove of greater value to the Archipelago than the introduction of the same number of kinds of any other food plant. The jack (*Artocarpus integrifolia*), a species closely related to the breadfruit, seems to be a general favorite in Tacloban and adjacent towns, in La Carlota and Pulupandan, and is also planted to a considerable extent in Dapitan, where a fruit was obtained that weighed approximately 25 kilos. The prevalence of the breadfruit in Iloilo and its luxuriant growth there has already been commented upon. It was, therefore, surprising to see its near relative, the jack, thriving

under the same conditions, so seldom grown in that locality. In Catbalogan not one specimen was seen.

The papaya (*Carica papaya*) is planted very universally throughout the islands visited and its growth is all that can be desired; but the variety grown is mostly a degenerate, dioecious type, the fruit of which is almost universally small and seedy and of very poor quality.

Three species of the genus *Anona* are grown in the Philippines—the soursop, or “guanabano” (*Anona muricata*), the sugar apple, or “ates” (*Anona squamosa*), and the custard apple, or “anona” (*Anona reticulata*). Of these the soursop in many places appears to be the favorite in the Visayas, markedly so in Tacloban and neighboring towns where the other species are rare. In Iloilo the sugar apple is very common while the other species are less in evidence; the custard apple seems everywhere to be less esteemed than either the soursop or the sugar apple. All species luxuriate wherever seen and the sugar apple and the soursop are abundantly productive. The fruitfulness of the sugar apple is due to the presence of certain species of *Coleoptera* that abound in the Philippines and which pollinate the flowers of this species. In Florida the writer found the same species of *Coleoptera* act as pollinizing agents for both the sugar apple and the cherimoya (*Anona cherimolia*), and with the species noted here it is, therefore, probably safe to predict that the cultivation of the cherimoya, the most esteemed species in the genus and one of the most famous of the tropical fruits, recently introduced into the Philippines by the Bureau of Agriculture, will be successful.

The sapodilla, or “chico” (*Achras sapota*), is not universally planted, perhaps for the reason that it is of slow growth and more tardy in the production of fruit than most other tropical fruits, few being seen outside of Tacloban, Iloilo, Cebu, and Argao, at which last point they are grown to considerable extent. The fruits are, in general, of good quality but very small. A rather inferior pineapple, “piña” (*Ananas sativus*), is found widely distributed in the southern islands, appearing here and there to naturalize itself. Cultivated fields of this species were nowhere noted during the trip. Many mangosteens (*Garcinia mangostana*), 10 meters tall, in prime condition and in full bloom, were encountered in Dapitan, where this species appears to be perfectly at home. No mangosteens were observed north of Mindanao. In only two places, Dapitan and Argao, were lanzones (*Lansium domesticum*) found planted in any considerable numbers. The introduction of this species into new territory

appears to proceed very slowly. North of Mindanao the durian (*Durio zibethinus*) is seldom, if at all, grown and it is rare even in that island. The ciruela (*Spondias purpurea*) is well esteemed by the native and is, in some localities, planted in considerable numbers; in fact the only fruit orchard worthy of the name seen during the trip, at Pulupandan, consisted of ciruela trees. The bilimbi (*Averrhoa bilimbi*) is very generally grown throughout the south and seems to bear well. Its relative, the carambola (*Averrhoa carambola*), a much larger fruit, is rather scarce. The guava (*Psidium guajava*) has naturalized itself throughout the region visited. The duhat (*Eugenia jambolana*) is scattered throughout the Visayas, and its near relative, the macopa (*Eugenia javanica*), a far inferior fruit, is quite generally planted everywhere—possibly because of its attractive appearance. The cashew, or “casoy” (*Anacardium occidentale*) is not generally grown. The tamarind, or “sampaloc” (*Tamarindus indica*), at once graceful and majestic, is a conspicuous object in most places, but does not appear to be very fruitful. The yambo (*Eugenia jambos*), and the macopa (*Eugenia malaccensis*), are, perhaps, less grown in the southern islands than any other fruits introduced. The santol (*Sandoricum indicum*) and the mabolo (*Diospyros discolor*), both species indigenous to the Philippines, are found throughout the region visited.

Inseparable from the Philippine villages in the Visayas, no less than in Luzon, is the betel-nut palm, or “buña” (*Areca catechu*), the fruit of which is of considerable local commercial importance, being extensively used as a stimulant by the Filipinos. The date palm (*Phoenix dactylifera*), so important in Northern Africa, Arabia, and adjacent countries, has scarcely been introduced into the Philippines; the only specimens of this species seen during the trip were found in Iloilo. As far as known, the date has never fruited in the Archipelago.

The grape (*Vitis vinifera*) and the fig (*Ficus carica*) were both introduced by the Spaniards and the grape is reported to succeed fairly well in Cebu. Unfortunately the writer did not have the opportunity to visit any of the vineyards and examine the vines. Fig trees exist in the gardens of wealthy Spaniards in Bais and Misamis, and probably elsewhere, but judging from fruits tested, it is doubtful if this fruit can be cultivated to advantage in the Philippines; the fig being a fruit of the temperate zone, this is, in fact, scarcely to be expected.

Aside from the data gathered, a very complete collection of seeds of the genus *Citrus* was secured that will be used in connection with the testing of different stocks for the cultivated

varieties of the orange, tangerine, pomelo, and lemon; an interesting miscellaneous collection of plant material of economic and ornamental plants was also brought to Manila.

It does not appear, from the observations made, that the presence or absence in certain localities of certain fruits is a reliable guide in regard to the adaptability, or vice versa, of a certain species to that locality. It shows, perhaps, rather a preference in a certain locality for a certain fruit, and also which were the first kinds introduced there; it indicates probably also the inaptitude of the natives to take hold of a new thing, clinging to early introductions in preference to more recent ones.

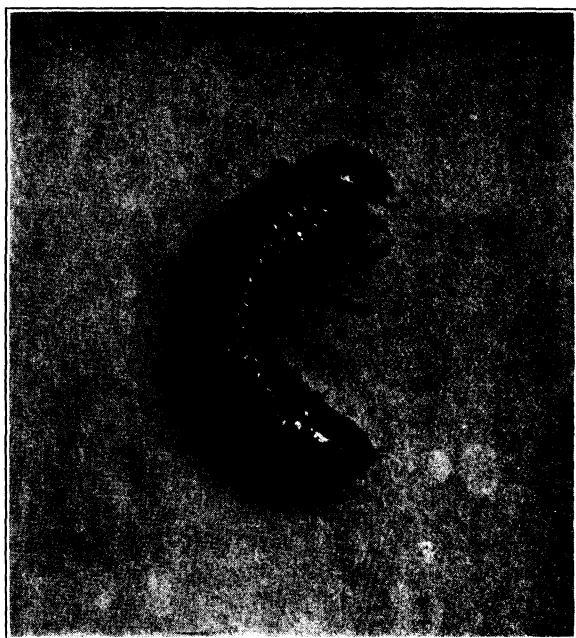
Most, if not all, of the cosmopolitan fruits referred to above have been introduced into the Philippines by the Spaniards—a not inconsiderable number of species, but there are many species absent that one might expect here after the long dominion of the Philippines by a once great European power with colonies in all parts of the tropics. Yet the situation in the Philippines in this respect, is, perhaps, not very different from that in many other tropical colonies.

Exceedingly few cultivated varieties of the genus *Citrus* have been introduced into the Philippines, and those so recently that their worth has not yet been established.

In the introduction of the mango—the fruit of which from the best types in the Philippines is of unsurpassed excellence, even superior in flavor to the East Indian varieties introduced into Florida that have fruited so far, and closely approaching them in their freedom from fiber and in their small seed—the Philippines have been more fortunate than any other part of the tropics where the seedling types mostly produce small fruits, inferior in flavor, very fibrous, and with a large seed. Unlike the East Indian grafted monoembryonic mangos which fail to do so, the polyembryonic mangos of the Philippines reproduce themselves practically true from seed. Fortunate in the introduction of the mango, the reverse is the case in the pineapple, only one mediocre variety having come to the attention of the writer, and no time should be lost in introducing the several superior varieties that are cultivated in Florida, the West Indies, Hawaii, and Singapore. The avocado (*Persea gratissima*), destined to become one of the great tropical fruits of the world, the asexual propagation of which has been solved in Florida within the last ten years where large budded orchards are now being rapidly brought into prominence, has never gained a permanent foothold in the Philippines until introduced by the Bureau of Agriculture a few years ago, and no trees of this

valuable fruit are planted in the Visayas, where apparently everything is favorable for their growth. The rapidity with which the seed deteriorates, making difficult its safe transportation to countries distant from its natural habitat, is responsible for this and partly explains the absence, until recently, of this species in the Philippines; but the failure to have introduced the cherimoya from Peru, Mexico, and Chile, the seeds of which are so easily transported, seems almost criminal negligence in view of the fact that three other species of the same genus, with vastly inferior fruits, have been imported and are flourishing. *Bertholletia excelsa*, the well-known "nigger-toe" nut from Brazil, the sapote blanco (*Casimiroa edulis*), also ceriman (*Monstera deliciosa*), the only aroid in the world that produces an edible fruit and that of great excellence, almost entirely seedless; the feijoa (*Feijoa sellowiana*), the culture of which, in California, is rapidly attaining considerable proportions and which is successfully cultivated in southern France, the tiess (*Lucuma rivicoa*, var. *angustifolia*), and many other species, are still waiting to be introduced into the Philippines from the Western Hemisphere, as is also the hevi (*Spondias dulcis*), now introduced into many parts of the tropics from its home in Polynesia. It is almost inexplicable how the roselle (*Hibiscus sabdariffa*) has escaped introduction from Malayasia and Indo China, and yet not more so than the no less remarkable absence of several species of *Nepheliums* and other fruits that are found in the Malay peninsula, Java, and adjacent islands. No fruit of African origin seems to have yet been introduced into the Philippines.

Sugar, copra, hemp and rice are, perhaps, destined to always be the great staple crops of the Philippines, and, in time, the cacao should become of considerable importance; but the soil, climate, and the geographical position of the Archipelago, with Manila as one of the great shipping centers of the Far East and its proximity to Hongkong, Shanghai, and the ports of Japan, with the heavy passenger traffic passing through these ports, are such as to insure a very substantial income from the production of fruits, if this industry is properly developed, and in this the Visayas should have a very considerable share.



(a)



(b)

PLATE IV.—(a) LARVA OF CANE ROOT BEETLE (*Holotrichia vidua* Sharp). (b) CANE
ROOT BEETLE (*Holotrichia vidua* Sharp).

SOME NOTES ON AGRICULTURAL PESTS.

By DAVID B. MACKIE, *Agricultural Inspector.*

During the month of April I was detailed to join a party composed of the Director of Agriculture and several members of his scientific staff, who were making a survey of the southern islands. The principal object of this survey was to ascertain certain facts relative to the rinderpest situation, and as the object of my investigations was to secure material pertaining to agricultural pests, the latter work was necessarily subordinated to that of the veterinary section, and only such data as could be secured by casual observation were obtainable.

As the time available in each place was so limited, it was decided, in outlining the work, to confine our attention to some of the more important crop pests and pay most attention to their distribution and prevalence in the different localities visited. Among the different crop pests those affecting mango, banana, citrus fruits, coconuts, and sugar cane were given attention.

The first locality visited was the east coast of Cebu, including the district bounded by Carmen on the north and Argao on the south. As the mango is one of the important crops in this region, special attention regarding the presence or absence of the insect pests affecting it was given. In the Danao district the mango web-worm was found to be very prevalent. The webs made by these insects are large and rangy, sometimes being over a meter in diameter and are generally spun about the terminal twigs; along the twigs and leaf petioles, which are inclosed by the web, are silken tunnels or passages over which are distributed particles of cut leaves and excrement. In these passages the larvae spend their time during the hotter part of the day. As the age of the brood increases the web is made larger and the number of passages increased until, as they reach maturity, the web has a ragged and unsightly appearance, which greatly injures the natural beauty of the tree. The caterpillars of this species are rather small, measuring a little over one

centimeter in length and yellowish green with darker markings, especially in the anterior parts; they spend the larval and pupal states within the web. From the fact that the insects live in colonies, it seems the egg mass is deposited on the twig by the female moth.

Compared with the above, the other mango pests were of minor importance; various scales were noticed on the leaves and branches and specimens secured for identification. A notable feature was the absence of two species of insects that are the cause of the greatest damage to the mango crop in Luzon. The more important of these two is a small leaf-hopper, probably an *Idiocerus*, which lays its eggs on the flower panicles of the mango trees and during the entire larval stage the insects suck the juice from the tree, and at the same time excrete a sweet, sticky substance upon which the ants feed, and protect the hopper for this reason.

Due to the operations of these insects the tree is unable to set fruit and the result is that it bears about 1 per cent of the normal crop. The other pest is a fruit-fly, which stings the fruit, causing it to fall, the fly emerging from the decayed fruit. While quite serious, this pest does not nearly equal the former in importance.

Of the pests affecting other crops the only one that was noticed was the bag-worm infesting the banana plants in the vicinity of the municipality of Cebu. While the extent of infested territory was very limited, yet in some places the leaves were simply riddled with holes. The damage appears to be done by three species—two smaller and one very large. The bag made by these insects is of silk, to which are attached small pieces from the leaves of the host plant. The bag is carried about by the insect until it becomes too small, when a new one is spun. It looks much like a curled-up leaf and serves its purpose of protection very well. The bags of different species vary; some are entirely of silk, while others are mixed with pieces of vegetable matter. This is the first time that the bag-worms have been noticed in colonies here; they are nearly always more or less solitary in their habits. As only one day was available for investigation in the vicinity of the railroad south of Cebu, no collecting was done. The following morning was spent in crossing the island from Carcar to Barili. With the exception of a few corn fields, comparatively little of the land in the immediate vicinity of this road is under cultivation. At Barili it was noticed that the fruit on a majority of the lucban (pomelo) trees was attacked by some small insect, evidently a species of *Lepidoptera*, which bored into the thick rind and spent the larval stage in the spongy part between the rind and the pulp.

It was impossible to secure specimens of these insects, as they had all developed and left the fruit. Affected fruit may be noticed by the wart-like protuberances on the rind. In view of the fact that this insect does not attack the flesh of the fruit, the damage done is not of great importance, as all the fruit is consumed locally and by people who pay little attention to such things.

At noon we were picked up by the Coast Guard cutter and proceeded directly to Bosoc in Oriental Negros, where a stop of a few hours was made. Here no pests of any importance were reported, excepting a few rhinoceros beetles in the coconut trees. The next day the cane fields in the vicinity of Bais were visited. The *hacenderos* reported slight damage from the cane root beetle and also some from tip-borers, etc. One noticeable feature in this district was the presence of large flourishing coconut groves in close proximity to sugar-cane fields, though it is claimed by planters in many districts that to grow the two crops successfully is impossible, owing to the "uang," or rhinoceros beetle, breeding in the sugar-cane rubbish. On what grounds they base their conclusions it is impossible to say, but from the condition of the crops in this district, it seems only a question of keeping the "bagasse" well cleaned up so as to afford no breeding-place for the larvæ.

On leaving Bais, the party touched at Dumaguete that night and sailed back to Cebu for coal.

Mindanao: After twelve hours stop at Cebu the party sailed arriving in Dapitan the following morning. Here everything seemed to be in good condition and few pests were noted, except fruit-flies in the citrus fruits. This condition prevailed along the entire north coast of Mindanao and at Misamis the banana-leaf roller was noticed, this being the first time it had been seen on the trip. It was also noted that individuals were carrying numerous cocoons of small ichneumon flies which probably accounts for the scarcity of this pest, its control being effected by these parasites. Here also it was observed that the citrus fruit trees formed the host plant for a species of mistletoe (*Loranthus secundiflorum*), which in many cases caused the death of the trees. In affected trees the dark, brush-like growth of the parasite can be readily seen; it is generally more or less spherical in shape with dark, glossy, green, ovate leaves. Should this plant become introduced among the citrus groves of Luzon it might, in time, develop into a rather troublesome pest.

At Cagayan, Misamis, the indications pointed to a good crop of coconuts with little loss from the rhinoceros beetle. A new

caterpillar was noticed attacking the lemon trees, which although of merely local distribution, was nevertheless very abundant where found. This insect feeds upon the leaves and rolls them up for protection during pupation, the small black pupa being found within the curled leaves.

At other places visited, including Oroquieta, Butuan, Agusan, Cabadbaran, Mambajao and Surigao, generally good conditions prevailed. From Surigao the journey was continued to Leyte where Tacloban, Palo and Tanauan were visited. Here a general survey showed no particular pests and conditions seemed favorable to good crops. Catbalogan, Samar, was the next place called at; as there is very little agriculture carried on in this district, only a casual survey was made.

The following day the party was landed at Pulupandan, Occidental Negros, and proceeded to La Carlota. At La Carlota experiment station four different pests were found to be attacking the growing cane. The one responsible for the greatest loss is the cane root beetle (*Holotrichia vidua* Sharp). This insect spends the larval stage beneath the ground feeding upon the roots of the sugar cane. The mature beetle is large and smooth, and a fair opinion of its size can be obtained from the illustration. The mature beetles fly about during the night and are attracted to lights. This insect is one of our most important pests, and throughout the La Carlota district whole fields have to be abandoned because of its operations. Among the other insects affecting cane was a small red weevil (*Sphenophorus* sp.) which spends the entire larval and part of the adult stage in boring through the heart of the cane, generally confining its operations to the base of the stalk. These galleries are extensive and in them the white grub pupates and later, after a period of six to nine days, transforms into a red weevil; it appears to spend most of its time in the cane, coming to the surface to mate. Several different moth borers were found in the upper part of the cane. One species confines its operations to the tips of the stalks, while another seems to work in the middle internodes. These borers, which are evidently some species of *Piraliidæ*, are very numerous in some parts of Negros.

At Iloilo little time was available for investigation and the few days there were spent in general observations in and around the city. Only one thing worthy of mention was noted here, this being the presence of leaf-hoppers on the mango trees; because of their attacks the same inability to set fruit was noticed.

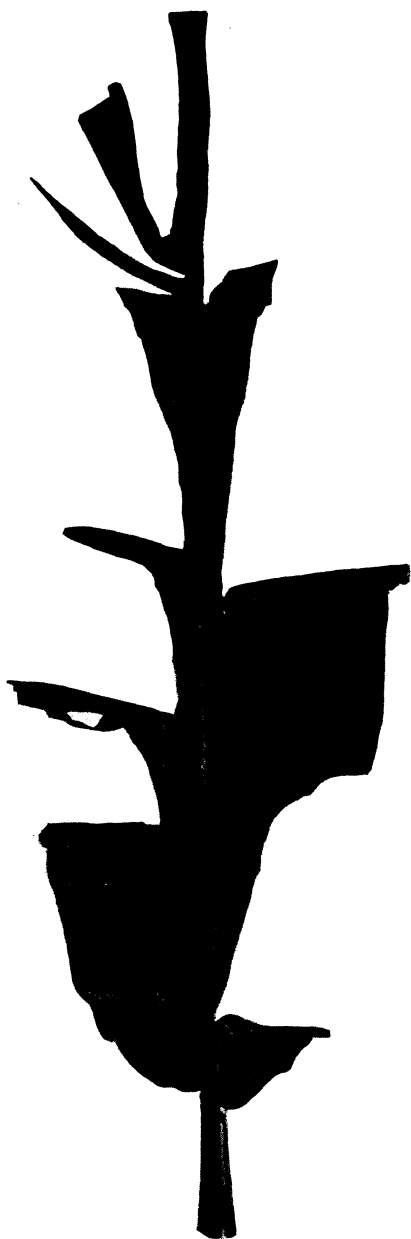


PLATE V.—BANANA LEAF ATTACKED BY BANANA-LEAF ROLLER (*Erionota thrax*).

THE FIRST ANNUAL CATANDUANES LIVE-STOCK EXHIBITION.

By Dr. F. C. GEARHART.

Much credit is due the progressive people of Catanduanes for the very successful live-stock exhibition which was held at Virac, July 4 to 7, inclusive. This is the first important live-stock exhibition ever held outside of Manila, and the people responsible for its success are to be heartily congratulated.

The following officers were elected by the central committee which was appointed by Lieutenant-Governor Señor Felipe Usero: President, E. H. Koert, Bureau of Agriculture; vice-president, Eustaquio Joson; secretary, Severiano Talión; treasurer, Capt. Pedro Arcilla.

The other members of the central committee were Señor S. Velez and Señor Fidel Abella. Señor Braulio Tapullar and Señor Eusebio Tejada also rendered valuable aid.

The exhibition opened on the morning of July 4 with a civic parade, which terminated in a fine agricultural park which has been prepared by the people of Virac. Four thousand five hundred people witnessed the coronation of the queen, Señorita Josefina Francisco, and listened to a very fine address by the Hon. Silvino Brimbuela, Assemblyman for the district. He explained the significance of the day as a national holiday, discussed the importance of the exhibition and the many advantages to be gained by the improvement of the live stock in the island, and explained how this improvement could be brought about. Señor Brimbuela took a great interest in the exhibition. He acted as judge, assisted by Señores Julian Pascua and Felipe Usero, and otherwise aided the committee in making the undertaking a success. The distribution of the premiums was made by the queen, assisted by her ladies in waiting, Señoritas Catalina Victoria and Feliza Francisco. Funds were secured by subscriptions, by the sale of votes for the election of the queen, and by a contribution of ₱90 from the provincial board of Albay. Some of the premiums were: From the International Chamber of

Commerce of Albay, ₱25; Judge P. N. Moir, ₱10; *El Heraldo Bicol*, ₱10; La Rosa Cigarette Factory, a valuable silver cup; Germinal Cigar and Cigarette Factory, ₱25 in merchandise; and from the Society for the Prevention of Cruelty to Animals, 12 bridles, 6 bits, and valuable literature.

It is estimated that 17,000 persons attended the exhibition. Much enthusiasm was in evidence and the people all returned to their homes resolved to raise better live stock. There were exhibited 620 stallions and mares, 64 cattle, 35 carabaos, 18 goats, 14 swine, and 37 chickens.

A show committee for the coming year has been organized and is already preparing for the second annual exhibition.

MONTHLY VETERINARY REPORTS—AUGUST AND SEPTEMBER.

Albay and Ambos Camarines.—Reports of disease have been received from a few municipalities in these two provinces. Mr. B. C. Ray, assistant agricultural inspector, sailed on September 7 for Sorsogon, Albay, and Ambos Camarines to investigate the situation and suppress any disease he might find there.

Bataan.—Rinderpest prevails in the municipalities of Orion and Pilar.

Bulacán.—There is some infection in the municipalities of Calumpit, Malolos, and San Miguel. The force of employees in this province is keeping the disease well under control, so that no serious losses are taking place.

Cagayán and Isabela.—There are several infected municipalities in these two provinces, but apparently very little loss has as yet been sustained. Dr. Ray O. Porter left for Aparri on September 7 with a force of live-stock inspectors to take charge of the outbreak in this district.

Cebu.—In the Island of Cebu there are eight infected municipalities, but the number of cases that have been discovered is surprisingly few. Losses that have been caused by the deaths of animals are so small as to pass almost unnoticed by the people in this section.

La Laguna.—Rinderpest has been eradicated from the municipalities of Pangil, Mabitac, and Siniloan, but during the beginning of this month the disease was again discovered in Santa Maria after that municipality was supposed to have been clean for several days. Infection has also recently been discovered at Santa Cruz.

Leyte.—Rinderpest has existed in the municipality of Tanauan during the past month, but there have been no cases for so long a time that this town is now considered practically free from disease.

Nueva Vizcaya.—The rinderpest infection has now been eradicated, the province being considered free from this disease on August 24, 1911.

Oriental Negros.—The municipality of Tanjay on the mainland of Oriental Negros is infected. A month ago there were several infected towns on the Island of Siquijor. A large force of veterinarians and live-stock inspectors, assisted by Scout troops, have made every possible effort to free the island from disease, and recent reports indicate that the task has practically been accomplished.

Pampanga.—In this province there are four infected municipalities, Minalin, Santa Rita, Mexico, and Florida Blanca.

Pangasinan.—The results that have been accomplished by the efforts to eradicate rinderpest in this province have been remarkable. It may well be said that success is due largely, if not wholly, to the great assistance rendered by the military authorities. Ten companies of Philippine Scouts have successfully maintained the quarantine that the large force of veterinarians and inspectors have found necessary. The campaign which was started in the eastern part of the province several months ago has proceeded gradually westward as the territory was cleaned, and now the force is occupying the most western towns with the expectation that within a few weeks the whole province may be declared free from rinderpest.

Rizal.—The municipalities of Antipolo, Pililla, and Tanay are still considered to be infected, but in none of these has a case of rinderpest been found for several days.

Tarlac.—The municipalities of Camiling, Concepción, and Tarlac are infected, a few cases being found in each town.

Zambales.—The municipalities of Castillejos, San Antonio, San Felipe, San Marcelino, San Narciso, and Subig, are infected. In all of these, except the last mentioned, the infection has existed for several weeks, and the force at work in that district has, it seems, practically accomplished the eradication of the disease in San Antonio, San Felipe, and San Narciso.

MONTHLY CROP CONDITIONS—JUNE AND JULY.

ABACÁ.

Albay.—Owing to a rise in price of this product in June, reaching 25 centavos a kilo for the better grades, a considerable amount was harvested and placed on the market. In July, owing to a drop in the price and on account of the rains, very little was harvested. Condition of the growing hemp is fair.

Ambos Camarines.—During the months of June and July 250 hectares were planted, and 82,000 kilos harvested from 1,000 hectares. A kilo is sold at 15 centavos.

Batangas.—Some cultivation in the towns of San Jose, Lipa, Santo Tomas, Tanauan, and San Juan; though, on account of low prices and lack of labor, there is very little production.

Bohol.—Less than 400 hectares planted in the Island, mainly for experimental purposes. Usual price per kilo 16 centavos.

Capiz.—Some damage in the municipalities of Libucan, New Washington, Malinao, and Cajidiocan, due to the recent storm, the loss being 25 per cent of the crop. Present prices from 17 to 23 centavos a kilo.

Cavite.—Some damage to the growing crop during the last storm. Present price is ₱20 for No. 1, and ₱18 for No. 2.

Cebu.—Approximately 100 hectares planted during the two months, during which time there was a production of about 70,000 kilos, the price ranging from 11 to 20 centavos per kilo. General condition of the plantations good.

Iloilo.—Very little harvesting going on on account of the continuous rainfall. Superior No. 1 is quoted at ₱20, and current at ₱10 per 63 kilos.

La Laguna.—In the towns of Paete, Longos and Lumbang, 1,000 piculs have been harvested, at ₱8 per 63 kilos.

Leyte.—No increase in the area planted. Some owners are clearing the land and putting in other crops. Outlook poor in this industry due to the present low prices, which ranged from ₱7 to ₱12.25 per 63 kilos.

Mindoro.—No damage was suffered in this section from the recent storm. Present price 18 centavos per kilo. Condition of plantations very good.

Occidental Negros.—One of the products of less importance in this province. Condition of the crop is fair, though considerable damage was done to the plantations during the last storm.

Oriental Negros.—Considerable effort is being made by the growers of this fiber to improve the quality of that produced by hand. The present price is 11 centavos per kilo.

Samar.—This crop is grown to a very considerable extent throughout the province, but owing to the fall in price there has been a great decrease in production as the returns do not compensate the work and expense, in spite of the good quality of fiber produced in this province.

Surigao.—Since the fall in price of abacá no new planting has been done; many plantations have been abandoned by owners who can support themselves in other ways. Good quality varies from ₱11 to ₱12 per 63 kilos.

COCONUTS.

Albay.—The loss caused by the recent typhoon is estimated at 25 per cent of the crop. Fourteen centavos per kilo is paid for copra. One thousand nuts are quoted at ₱25. Forty centavos a liter is paid for the oil.

Ambos Camarines.—23,200 trees were planted in Bato, and about 15,000 nuts were gathered in Milaor. The price per 100 kilos of copra is ₱13.50, ₱2.50 for 100 nuts and 13 centavos a liter of oil.

Bataan.—Cultivated to only small extent in this province, especially in the municipalities of Mariveles, Pilar and Morong. Fresh nuts are sold at 10 centavos each, and, if dried, at 5 centavos.

Batangas.—Cultivated only in the towns of Lipa, San Juan, Santo Tomas, and Tanauan. Considerable damage was suffered from the insects known locally as *wang*. The greater part of the nuts used in this province come from the neighboring provinces of Mindoro and Tayabas. The present price for 100 is ₱4.50.

Bohol.—No damage to this section from the recent storms. Condition of growing crop very satisfactory. The copra is sold from 14 to 16 centavos per kilo.

Bulacan.—Grown on small scale for local consumption. Some damage was suffered from the insects called *wang*. The price paid per nut is 6 centavos.

Capiz.—Present price of copra is 12 centavos a kilo; of the nuts, 4 centavos each. Tuba is sold at 12 centavos per liter. General condition of this crop fair.

Cavite.—Considerable damage during the last storm. No copra was produced during the month of July and the nuts were sold at ₱2 per 100.

Cebu.—Over 3,000,000 kilos of copra produced during June and July, the price ranging from 8 to 15 centavos a kilo; the nuts are sold at 4 centavos each. The price for tuba is 3 centavos for each deciliter. Condition of plantations is excellent.

Ilocos Norte.—Owing to the ravages of the coconut beetle very little is planted in this province, supplies of nuts coming from other provinces. Each nut is worth at present from 15 to 20 centavos.

Ilocos Sur.—The beetle commonly known in Ilocos as *Barrairong* has done much damage to the coconut trees by boring the buds. The nuts are sold in the local market at ₱40 per thousand.

Iloilo.—No damage to the growing crop from insects or storm. Present price of copra is ₱11 per 63 kilos. General condition is satisfactory.

La Laguna.—Some 50,000 coconuts have been planted. Price of copra is ₱9 a picul, and from ₱25 to ₱30 per 1000 is paid for the nuts; the oil is sold at from ₱14 to ₱17.50 per jar containing 48 liters.

La Union.—At present there is no production of copra on account of the recent typhoons. Current price is 5 centavos for each nut.

Leyte.—Considerable increase in the number of new plantings. Harvest good. Copra sells at from ₱8 to ₱9.50 a picul, the nuts from ₱20 to ₱24 per thousand, and the oil at ₱9 per jar of 8 gantas.

Mindoro.—Condition of growing crop good. 12 centavos per kilo is paid for copra. Tuba is sold at 4 centavos per liter.

Occidental Negros.—Some slight damage from the recent storm. That produced locally is sent direct to Iloilo for sale.

Oriental Negros.—Coconut trees did not suffer damage notwithstanding the recent strong winds. The price paid for copra is ₱9.50 per 63 kilos. The nuts are sold at 3 centavos each, and the tuba at 3 centavos per liter.

Palawan.—Coconuts are being planted in Palawan and Coron. Copra brings ₱8 per 63 kilos sun dried. Trees are in good condition.

Pangasinan.—Local price of the nuts is from ₱3 to ₱4 per 100 according to the size of same.

Samar.—Very little harvesting on the east and south coasts of this province, due to the storms of 1908, 1909, and 1910. The price per kilo of copra in June was from ₱8 to ₱8.50. The nuts

sold locally at ₱2 per 100. In many towns in the province tuba is produced which is sold at 20 centavos per 5 liters.

Sorsogon.—Owing to insects and the recent storms there has been very little production resulting in rather high prices. Copra sells at 14 centavos per kilo, and the nuts at 4 centavos each. The price of oil is 40 centavos a liter, and the tuba 3 centavos per liter.

Surigao.—Coconut planting continues in almost all the municipalities of this province, and it is expected that in the near future coconut raising will be the most important industry in this section. The price of white copra ranges from ₱10 to ₱10.25, and for current from ₱9 to ₱10.

CORN.

Albay.—Very little planting on account of the beginning of the rainy season. One hundred ears are sold for ₱1. Consumed locally for domestic use and for feeding poultry. No shelled corn seen in the market. The harvest has been good and the condition of the growing crop is very satisfactory.

Bataan.—In excellent condition before the storm, during which considerable damage was done. In the ear, the price is from 40 centavos to ₱1 per 100. The shelled corn sells at 2 centavos a liter.

Batangas.—This is the season for harvesting this crop, but due to insects and worms (*dupulax*), and the strong winds, there is not even a fair amount produced. The price per cavan of shelled corn, equivalent to 75 liters, is ₱3.50.

Bulacan.—Suffered considerable damage from the recent storm and ensuing flood. Shelled corn at ₱3.50 for 75 liters; in the ear at 1 centavo per ear.

Agayay.—Condition poor due to the long and steady drought in the months of May and June, since when the floods have caused still further damage.

Capiz.—Considerable damage caused by the storm, the loss being estimated at half of the mature crop, especially in the town of Cajidiocan. In the provincial capital the ears are sold at 50 centavos per 100. The general condition is fair.

Cebu.—A large amount of planting has been done during the last two months. The price per kilo ranges from 5 centavos to 10 centavos per liter of shelled corn. Condition of plantations in general good.

Ilocos Norte.—A large area was planted, but on account of the severe drought and the following typhoon the results were very unsatisfactory. In the provincial capital ₱2 is paid for every 46 kilos on the cob. Shelled corn brings ₱6 for 46 liters.

Iloilo.—Harvesting is now going on, though there is no corn for sale in the market. General condition is poor due to bad weather.

La Laguna.—The plantations were damaged by the two storms which occurred during the month. Those near the coast of the lake have been inundated, and those in high open places have suffered from heavy rains and strong winds. It is estimated that the loss is about 25 per cent of the crop. The price paid per 1,000 ears, according to the quality, ranges from ₱5 to ₱10.

Leyte.—Large plantings of this product are being harvested in this province. No damage suffered from recent storms.

Nueva Ecija.—An estimated loss of 75 per cent of the crop is reported, due to the storms and floods. Present price 75 centavos per 100 ears.

Surigao.—Continuous planting and harvesting is going on. The production bids fair to be the largest ever seen in this province. Seventy-five liters of shelled corn bring ₱3.75.

RICE.

Ambos Camarines.—Three thousand five hundred hectares planted to this crop in June and July. ₱6.70 per cavan is paid for clean rice and ₱3 for palay.

Bataan.—Some damage from lack of rain, and worms. Present price of palay in the capital of the province is ₱3 per 75 liters.

Batangas.—Lowland plantings were completely destroyed by the recent floods. Considerable damage to the seed beds. In high places where transplanting has been done the condition is much better. The price for clean rice is ₱9.33 centavos per 100 liters, and for unhulled rice ₱4.40 per 100 liters.

Bulacan.—In the lowland the condition of the palay is very poor owing to the recent floods; on higher grounds the general aspect is much better.

Cagayan.—Clean rice is sold at the rate of ₱10 per cavan for first class, ₱8 for second, and ₱7.50 for third. These high prices are due to the floods which lasted from the 14th to the 16th.

Capiz.—Some damage to the palay fields in the towns of New Washington, Malinao, and Cajidiocan, especially in Libacao. The general condition promises a good harvest.

Cavite.—In many sections the crop has resulted in an entire loss owing to the heavy and constant rains.

Cebu.—More than 3,000 hectares planted during the two months. The general condition of the plantations is good.

Ilocos Norte.—Very few sprouts survived the recent drought

making it necessary in many cases to prepare new seed beds. There is an estimated loss of one-fifth of the regular crop.

Iloilo.—Early and regular rains have been falling making the prospect for the coming crop excellent.

La Laguna.—The dry season crop has been harvested and lands are now being worked for the wet season crop. No damage from storms.

La Union.—Some slight damage was suffered on account of the recent typhoon.

Mindoro.—On lands irrigated by rainfall the seeds are sown during May, transplanted thirty days later, and harvested at the end of one hundred and twenty days. In high dry lands and *caingins* the seeds are sown on the spot during May and harvested one hundred days later. General condition good.

Palawan.—Mountain or dry rice planting finished this month. Weather condition for same is good. Palay is worth ₱3.50 per cavan. Manila rice sells at ₱7.50. More rice planted this year than last. Condition good.

Pangasinan.—During the early part of July clean rice sold at from ₱6.75 to ₱7 per 75 liters. Owing to the storms and floods during the later half of the month the price reached ₱10 per 75 liters.

Samar.—On the north coast the crop has been satisfactory, while on the east and south it has been poor on account of insects and floods which have caused great damage.

Tarlac.—Some loss in the seed beds on account of the inundation of the Tarlac River. The condition of the growing palay is fair.

SUGAR CANE.

Albay.—Very little planting and harvesting is going on in this province. A panocha of approximately 250 grams sells for 25 centavos.

Bataan.—General condition of the fields is excellent although in some plantations slight damage has been done by the strong winds.

Batangas.—This crop is generally grown in the sea coast towns of this province. Nearly all the plantations are in excellent condition, though some have suffered serious damage from the storms. The price of 63 kilos of sugar is ₱6.

Bulacan.—Considerable damage on account of the recent typhoon and the great number of rats that appeared in this section. Present price of sugar is ₱6 for 63 kilos.

Capiz.—No damage to this crop was reported during the month. The price paid for sugar is 17 centavos a liter.

Cebu.—21,949 hectares of land have been planted to this crop. The price per kilo varies from 10 to 11 centavos. General condition of plantations is excellent.

Ilocos Norte.—The fields suffered considerable damage from the recent drought but the following plentiful rains assure a good crop.

Iloilo.—Late planting in the highlands is about to end. The weather conditions are not favorable for late crops. Owing to early rainfall the general condition is not satisfactory. In many places the lowland plantings were lost.

La Laguna.—The sugar cane plantations are in excellent condition, and promise a good and abundant harvest. Estimated to be about 50 per cent over that of last year. Sugar is quoted at from ₱4 to ₱7 according to grade.

La Union.—In spite of some slight damage during the last baguio it is very probable that there will be a good crop. Sugar in panochas is sold at 6 centavos per liter.

Nueva Ecija.—Up to the present time no damage to the crop has been reported. Present price ₱7 per 63 kilos.

Occidental Negros.—The continuous rains have retarded the growth and development of the cane. As a result, there is an estimated decrease in the production. Sold at ₱6.50 per 63 kilos, assorted.

TOBACCO.

Batangas.—Grown in the town of San Jose, to a considerable extent. The price in the provincial capital is ₱9 for 46 kilos.

Cagayan.—Good quality harvested. Commercial operations have begun slowly. The price is still unsettled, present quotations being ₱4.75 per bale.

Cebu.—Some 373,000 kilos have been harvested, the price ranging from 12 to 80 centavos per kilo according to the quality of the tobacco. General condition of the plantations is fair.

Ilocos Norte.—The general aspect of the crop is better than that of previous years. The price in the provincial capital is ₱5 for 46 kilos.

Ilocos Sur.—The production of tobacco during the last month is estimated at 60,000 pounds.

La Union.—Some loss of tobacco in deposit on account of recent floods, especially in Naguilian. Present price from ₱7 to ₱7.50 per quintal.

Mountain Province.—Quantity grown of very fine quality and compares favorably with the best Isabela leaf. Sold in small quantities in Cagayan and Abra.

CURRENT NOTES.

SENSITIVE PLANT.

The Chamber of Agriculture of New Caledonia is offering sensitive plant seeds (*Mimosa pudica*) to the agriculturists of that Island. Judging by the price (50 centavos per kilo) and the directions for insuring rapid germination of the seeds, it would seem that the matter is being taken up quite seriously by the said chamber. This is somewhat remarkable in face of the fact that in many, if not all, tropical countries this plant has become a weed and in some instances a serious pest, killing out the natural grasses and intertwining its spiny stems among the forage and thereby rendering it practically worthless. One good report of it in the Philippines has reached this Office, but the statement that this plant was much relished by cattle leads one to suspect that there must be considerable variation of individual preference among animals in regard to this plant—or else that some semi-spineless form has originated here.

DESTRUCTION OF LANTANA.

The Chamber of Commerce of New Caledonia has just sent an expert to Hawaii to collect and take back a quantity of the flies which have been found to greatly assist in keeping that terrible weed in check there.

This shrub which caused so much damage in Hawaii a few years ago is now generally scattered throughout the Philippines and is spreading, not rapidly perhaps, but surely, unless more active measures are taken to eradicate it. So far as we know the only efforts made to destroy this plant on a large scale have been made at and near La Carlota experiment station, Occidental Negros.

BLIGHT-RESISTANT COFFEES.

Since the advent of the coffee blight (*Hemileia vastatrix*) into the Philippines some twenty-five or thirty years ago, it has been practically impossible to raise even a fair crop of coffee below 2,000 feet elevation. This blight destroyed the coffee industry not only in the Philippines but in Java, Ceylon, and the Malay Peninsula at about the same time that it reached this Archipelago.

An attempt is being made now by several of the old coffee countries to discover or create one or more varieties of coffee which will be resistant to this fungus, and it is believed there is some hope in some of the new hybrids of robusta coffee (*Coffea robusta*). This Bureau now has growing at the Lamao experiment station a considerable quantity of this coffee, and a little later seed will be distributed to any one who wishes to experiment with the variety. However, like several of the noncommercial coffees this robusta does not have a first-class flavor, though it is in some respects better than that of either Liberian (*C. liberica*) or the Inhambane coffee of Mozambique. Another trouble with the new coffees is that they are for the most part very weak in caffeine, the active principal of the beverage—some of them possessing no stimulating qualities whatever.

COPRA TRADE IN THE PHILIPPINES.

The Philippine Islands shipped abroad 116,374 metric tons of copra in the calendar year 1910, and the average price for the year was about $3\frac{1}{2}$ cents gold per pound. The price increased during the year from about 3 cents to about 4 cents gold per pound in the last quarter.

The steady growth of the trade is indicated by the fact that shipments increased from 168,473,499 pounds, valued at \$5,461,680, in 1908, to 232,728,116 pounds, valued at \$6,657,740, in 1909, and to 254,156,982 pounds, valued at \$9,153,951, in 1910 (fiscal years in each case), and that there was an increase from 113,463 metric tons in the fiscal year to 116,374 metric tons in the calendar year of 1910.

Because of the high price, due chiefly to the extraordinary demand for vegetable oils, and because of the strong demand generally, there is something of a boom in the coconut business in the Islands, and the increase in trade is having a marked effect, not only on the Islands themselves, but upon shipping in the Far East and other lines of business.

Importance of the crop.—In the Philippines the export of copra is now the second largest element in the foreign trade, comprising almost a fourth (23 per cent) of the whole and being exceeded only by hemp. Coconut planting is being carried on more extensively than ever before. Six years ago there was a period of high prices, during which time extensive plantings were made, and these trees will come into production this year. Indications are that the export of the product during 1911 will exceed all previous years in volume, while, owing to the

shortage of other oil-producing crops, the prevailing high prices may continue for some time.

Naturally, such conditions are leading to a general expansion of business in all lines connected with coconut planting and plantation supplies.

Growth of trade with the United States.—Exports of copra from the Philippines to the United States have more than kept pace with the increased imports into the latter country due to the demand for coconut oil. The total imports of copra into the United States during the fiscal years 1908, 1909, and 1910 were \$481,232, \$666,820, and \$762,560, respectively, and the imports thereof from the Philippines were \$213,999, \$273,497, and \$416,074, respectively.

The increase in imports of copra into the United States during the three years was about 58 per cent, while the increase in imports from the Philippines was about 90 per cent. Nevertheless, most of the product went to France, mostly to Marseille, where the great coconut-oil factories are largely dependent upon the Philippines for their copra supplies. France took \$6,114,324 worth of the product in the last fiscal year. Germany, particularly Mannheim, takes an increasing quantity, while Spain maintains a trade long established. (Daily Consular and Trade Reports.)

PHILIPPINE HARDWOODS.

The general scarcity of good hardwoods in China has long been noted in the southern portion of the Empire. Recently some of the lumber exporters of the Philippines have come to realize that there seem to be excellent possibilities along these lines, especially in the coast ports. In order to test the market, a shipload of logs has been sent to Shanghai and will there be sawed in such a way as to best appeal to that local market. Owing to the scarcity of labor in the Philippines and its high price, it may be possible to ship the logs to China, have them sawed in China and distributed along the coast at a less total cost than if they were sawed in the Philippine and shipped direct. (Daily Consular and Trade Reports.)

PHILIPPINES AT SAN FRANCISCO.

Philippine business interests are anxious to have an exhibit, costing at least \$250,000, representing the Islands at the Panama-Pacific Exposition at San Francisco and are at work with a view to securing it. (Daily Consular and Trade Reports.)

HEMP EXPORT DUTY.

Practically all growers and dealers in the Philippines interested in the hemp industry agree in the opinion that the removal of all export taxes from the product is necessary for the development and improvement of the industry. The matter has been taken up formally for presentation to the proper authorities in Washington. The present export duty is 75 cents per 100 kilos, or 220.46 pounds, except for direct shipments to the United States, when no export duty is charged.—B. of M. (Daily Consular and Trade Reports.)

ROSELLE.

The roselle (*Hibiscus sabdariffa*) which was introduced and distributed to a limited extent this spring by the Bureau, is making a most satisfactory growth at the experiment stations, and a good yield of fruit and seed for future distribution is expected.

The roselle is an annual related to the cotton and okra, and is probably the only plant in the world whose calyces are utilized for food. The plant flowers in October and the rapidly developing fleshy calyces are picked and used in making sauces, jellies, or jams, very similar in flavor to those made from the cranberry. A good wine is also made from the calyces. A very agreeable cooling drink may be made from the leaves and tender twigs, steeped in boiling water. In India the roselle is grown principally for its fiber.

The many useful qualities of the roselle and the ease with which it may be cultivated are sure to make it a favorite among all classes as soon as it becomes known in the Philippines.

INTERNATIONAL RICE CONGRESS AND INTERNATIONAL
EXPOSITION OF RICE CULTURE AND
IRRIGATION (TO BE HELD AT
VERCELLI, ITALY).

At Vercelli, the governmental seat of a rice-producing region par excellence, which has the advantages of vicinage and convenient communication with the other most important Italian rice districts, there is now being organized the International Rice Congress in connection with the Rice Culture and Irrigation Exposition, both of which will be held in October, 1912.

In this congress there will be discussed vital questions of the present day relative to rice culture, that is, technical questions bearing on the subjects of rice, of rural and social economy, and of hygiene and commerce in their intimate and direct relation to rice culture; other similar matters affecting irrigation will also be investigated.

Such particular interest will attach to the international exposition of rice culture and irrigation, that it is proposed to collect in special exhibits all that concerns rice culture and irrigation, in order to give an idea of the progress made therein and the present status of both.

In Italy, where rice culture is of great importance with respect to other countries, where irrigation presents the oldest, the most classic, and at the same time the most perfect examples of such work, and where, nevertheless, in her arid regions there are problems that urgently demand solution, we may justly take the initial steps in the organization of this special exposition of rice culture and irrigation.

In the exposition of rice culture there will be collected specimens of all the material and machinery necessary for the cultivation, harvesting, drying and commercial preparation of rice. There will be exhibits of commercial rice, a special exhibit of select seed rice, an exhibit of rice intended for exportation or for domestic consumption, and of the products derived therefrom. Another feature will be exhibits of fish culture in the rice regions, exhibits concerning hygiene and diseases in their relation to rice

plantations, exhibits of agrarian associations and organizations and offices for the employment of laborers for rice farms, and matters pertaining to the rice industry and to technical instruction in the various branches. There will also be a retrospective exhibit of the rice industry and of rice culture.

In the irrigation exposition, there will be exhibits of the different systems of irrigation, water sources, dams, artesian wells, elevators, water meters, mechanical appliances used in irrigation, monographs on irrigation, irrigation firms, companies and partnerships, etc.

As soon as possible the program pertaining to this subject will be published.

BOOK REVIEW.

By O. W. BARRETT,

Chief of the Division of Experiment Stations.

Notes on the Soil and Plant Sanitation of Cacao and Rubber Estates, by Harold Hamel Smith, (John Bale, Sons & Danielsson, Ltd. price 10 shillings, net). This book appears to meet a long-felt want of the tropical planter, not only in rubber and cacao lines, but in all branches of tropical agriculture which are based upon plant and soil ecology and biology. The book is published in London by the Tropical Life Publishing Department (John Bale, Sons & Danielsson, Ltd.), the author himself being the editor of the very popular planter's journal, *Tropical Life*.

The book contains chapters on the principal subjects of vital interest to the tropical planter, such as stump pulling, protective belts, green manuring, preparation of plant foods from waste products, fungi pests, etc. There are also up-to-date ideas on cacao grafting, rubber diseases, etc., and the latest mechanical appliances from plows to cacao polishers and rubber-smoking machinery are fully discussed.

Instead of the author giving his own views, which are, however, well worth consideration, the opinions of the world's principal experts in cacao, rubber, and tropical estate management are given, either verbatim or condensed, on their respective specialties.

The book is thoroughly modern in every feature, and while perhaps somewhat too "specialized" for the average estate superintendent, no estate proprietor in the tropics can afford to be without this handbook of modern estate sanitation.

MARKET REPORTS.

Notes on Manila markets for July.

By KER & Co.

(Based on advices from New York, June 16; San Francisco, June 21; London, June 29;
Hongkong, July 25; Iloilo, July 25; Cebu, July 29.)

SUGAR.

Iloilo.—Prices in the interval have advanced smartly on advices from New York; we quote ₱8.75 No. 1, per picul first cost, ₱8.25 No. 2, and ₱7.25 No. 3. There is little, if any, sugar still in first hands and the season is practically finished; shipments after August will be trifling.

HEMP.

Quiet but steady at ₱9.50 United States and ₱9 United Kingdom current per picul first cost f. o. b. Good current quoted ₱16 per picul first cost. About 10,000 bales have been burnt in fire at Cebu. Receipts at all ports for the seven months were 748,809 bales against 801,487 bales in 1910 and 731,734 bales in 1909, for the corresponding period.

COPRA.

Steady at ₱11.50 per picul Cebu fair merchantable sun dried and ₱10.75 Manila fair merchantable, first cost f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE SEVEN MONTHS (JANUARY TO JULY, 1911).

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Singapore.
Dry sugar (tons) -----	82,709	14,776	12,625	2,500	63,176	14,138	14,909	6,415
Hemp (bales) -----	262,314	6,450	-----	307,669	680,178	-----	1,517	-----
Copra (piculs) -----	16,400	-----	106,400	35,200	6,357	5,507	589	8,215
Cigars (thousands) -----	6,721	19,020	-----	6,672	-----	-----	-----	-----

RECEIPTS AND SHIPMENTS OF MANILA HEMP.

(Telegram from Manila to London, August 7, 1911.)

	1911	1910
Hemp receipts at:	<i>Bales.</i>	<i>Bales.</i>
Manila, since January 1	607, 226	633, 035
Cebu, etc., since January 1	171, 503	193, 201
All ports since January 1	778, 729	826, 236
Shipments by steamer to:		
United Kingdom, cleared since January 1	310, 914	293, 173
Atlantic coast, United States, cleared since January 1	220, 284	315, 699
Pacific coast, United States, cleared since January 1	99, 870	64, 093
Continental ports, cleared since January 1	63, 179	36, 626
Shipments to:		
All other ports	52, 841	
Local consumption since January 1	7, 000	
	59, 841	44, 375
Loading steamer on the berth for:		
United Kingdom, about		1, 300
Atlantic coast, United States, about	26, 000	5, 200
Shipments per sailer to Atlantic coast, United States, since January 1		20, 650

Bales of hemp loading for United States, by steamer :

St. Ranaid	2,000
Shimosa	11,000
Kabinga (Cebu)	13,000

LONDON FIBER MARKET.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, on July 5, 1911.¹

Manila hemp.—The market for fine marks has likewise been a steadily rising one. Values good current £34, fine marks £40 to £44, according to quality, even £45 has been refused for one of the finest marks. Spot hemp has benefited from the firmer tendency for forward shipment. Early in the week a few insignificant sales were effected on the basis of £19 5/- to £19 10/- for fair current, but at the close, there are further buyers without sellers except at an advance. Closing values nominally fair current £19 15/-, and good brown £18 15/-.

Range of prices.

Grades.	Spot and close by.		
	Per ton.	Per ton.	Per picul.
Best marks	40/- - 43/-	£400. 00-£430. 00	£25. 00-£26. 90
Good marks	38/- - 40/-	380. 00- 400. 00	23. 75- 25. 00
Good current	33/- - 34/-	330. 00- 340. 00	20. 63- 21. 25
25 per cent over current	22/- - 22/6	220. 00- 223. 00	13. 75- 13. 95
Fair current	19/9 - 20/-	194. 50- 200. 00	12. 16- 12. 50
Superior seconds	19/3 - 19/6	191. 50- 193. 00	11. 97- 12. 10
Good seconds	19/- - 19/3	190. 00- 191. 50	11. 85- 11. 97
Fair seconds	18/9 - 19/-	184. 50- 190. 00	11. 55- 11. 85
Good brown	18/6 - 18/9	183. 00- 184. 50	11. 45- 11. 55
Fair brown	18/- - 18/6	180. 00- 183. 00	11. 25- 11. 45

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

Sisal hemp.—No change in the New York market, which remains nominally at $4\frac{7}{8}$ cents charges including freight Europe for fair average quality. It is to be noted that while stocks of this article only three to four months ago exceeded 120,000 bales, they have now been considerably reduced, and to-day probably do not exceed 30,000 bales. Even this quantity is probably in course of transshipment, as we hear from our friends in Yucatan that the stocks in the hands of planters have been entirely exhausted.

Manila maguey.—During the past two or three months a large business has taken place in this commodity. This is not surprising in view of the relatively low figures ruling as compared with prices for all other white fibers. We consider the article deserves more than usual attention. We quote No. 1 Cebu at £19, No. 1 ordinary at £16, No. 2 at £15 and No. 3 at £13 10/-.

The Manila quotations for the same date were ₱7 for No. 1.

ILOILO SUGAR MARKET.

Sugar was received from the mills and sugar districts amounting to 396,295 piculs for May and 238,405 for June. The price of 6 pesos and $2\frac{1}{2}$ reales¹ at the beginning of May dropped on the 2d to 6 pesos and one-half real; this continued until the 18th when it went down to 5 pesos and $6\frac{1}{2}$ reales, since when there was a gradual decline to 5 pesos and $4\frac{1}{2}$ reales. During June there was but a slight increase, and that was on the 7th when 5 pesos and $5\frac{1}{2}$ reales were paid until the 12th; on this date 5 pesos and $4\frac{1}{2}$ reales was again quoted, which price remained steady until the close of the month.

MAY SHIPMENTS.

[In piculs.]

Date.	Vessel.	Destination.	Superior.	Wet.
May 3	Strathtay	U. S. of America	89,600	
May 13	Strathgyle	do	91,200	
May 17	Kygja	San Francisco	20,000	
May 22	Indramayo	U. S. of America	96,000	
Total for May			296,800	

¹ One real equals $12\frac{1}{2}$ centavos.

JUNE SHIPMENTS.

[In piculs.]

Date.	Vessel.	Destination	Superior.	Wet.
June 3	Teau	Hongkong via Manila	2,600	
June 9	Indrawadi	U. S. of America	68,000	
June 24	Teau	Hongkong via Manila	1,494	
June 25	Bisley	U. S. of America	80,000	
Total for June			152,094	

EXPORTS UP TO JUNE 26, 1911.

[In piculs.]

To—	1909-10 crop.		1910-11 crop.	
	Superior.	Wet.	Superior.	Wet.
United States	588,000		830,800	
China	64,575	29.38	140,066	426
Total	652,575	29.38	970,866	426

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— MAY, JUNE, AND JULY.

By the INSULAR COLLECTOR OF CUSTOMS.

[Values in dollars, United States currency.]

MAY.

IMPORTS.

Articles.		Manila.	Cebu.	Iloilo.	Totals.
Rice	{Kilos.---	6,985,253	4,203,629	1,286,666	12,475,548
	{Value---	219,208	152,305	46,969	418,482
Beef cattle	{Numbers---	2,849			2,849
	{Value---	66,207			66,207
Eggs	{Dozens---	442,033	63	347	442,443
	{Value---	31,707	7	36	31,750
Sugar	{Kilos.---	198,624	17,436	26,596	242,656
	{Value---	15,975	1,291	1,855	19,121
Coffee	{Kilos.---	46,365	1,293	31	47,689
	{Value---	15,827	255	11	16,093
Cacao	{Kilos.---	60,015	20,561		80,576
	{Value---	16,842	5,566		22,408
Raw cotton	{Kilos.---	57,478			57,478
	{Value---	20,243			20,243

EXPORTS.

Hemp	{Kilos.---	11,686,773	2,043,700		13,730,473
	{Value---	1,098,247	209,089		1,307,336
Copra	{Kilos.---	4,847,607	99,800	201,639	5,149,046
	{Value---	390,148	8,200	16,450	414,798
Sugar	{Kilos.---	12,647,040	1,013,266	14,319,375	27,979,681
	{Value---	602,084	54,000	769,493	1,425,577
Cigars	{Thousand---	9,013			9,013
	{Value---	134,289			134,289
Cigarettes	{Thousand---	3,147			3,147
	{Value---	3,244			3,244
Tobacco	{Kilos.---	1,287,333			1,287,333
	{Value---	195,751			195,751

JUNE.

[Values in dollars, United States currency.]

IMPORTS.

Articles.		Manila.	Cebu.	Iloilo.	Totals.
Rice	{Kilos	3,398,752	3,985,237	3,297,020	10,681,009
	{Value	121,486	139,809	112,874	374,169
Beef cattle	{Numbers	1,727	198	300	2,225
	{Value	42,913	4,739	7,492	55,144
Eggs	{Dozens	409,635	82	209	409,926
	{Value	26,998	8	21	27,027
Sugar	{Kilos	143,875	20,027	37,462	201,364
	{Value	9,709	1,534	2,407	13,713
Coffee	{Kilos	76,388	2,112	410	78,910
	{Value	19,298	622	223	20,143
Cacao	{Kilos	81,955	6,157	44	88,156
	{Value	19,561	1,712	13	21,286
Raw cotton	{Kilos	11,548			11,548
	{Value	4,133			4,133

EXPORTS.

Hemp	{Kilos	13,138,861	4,187,100		17,325,961
	{Value	1,155,146	400,755		1,555,901
Copra	{Kilos	3,843,272	1,772,056	352,442	5,967,770
	{Value	327,699	154,920	30,360	512,979
Sugar	{Kilos	13,384,178		9,704,901	23,089,079
	{Value	668,362		496,839	1,165,201
Cigars	{Thousand	10,087			10,087
	{Value	139,973			139,973
Cigarettes	{Thousand	3,087			3,087
	{Value	3,333			3,333
Tobacco	{Kilos	790,477			790,477
	{Value	130,614			130,614

JULY.

[Values in dollars, United States currency.]

IMPORTS.

Articles.		Manila.	Cebu.	Iloilo.	Totals.
Rice	{Kilos	12,351,803	3,918,655	3,098,249	19,368,707
	{Value	419,009	110,354	98,628	627,991
Beef cattle	{Numbers	2,465		3	2,468
	{Value	60,144		250	60,394
Eggs	{Dozens	447,542	28	363	447,933
	{Value	30,440	2	40	30,482
Sugar	{Kilos	276,514	3,482	14,481	294,477
	{Value	19,262	307	977	20,546
Coffee	{Kilos	103,180	2,351		105,531
	{Value	27,976	686		28,662
Cacao	{Kilos	46,347	5,036	582	51,965
	{Value	12,136	1,385	175	13,696
Raw cotton	{Kilos				
	{Value				

EXPORTS.

Hemp	{Kilos	2,491,646	2,642,712		5,134,358
	{Value	249,827	274,909		524,736
Copra	{Kilos	5,906,065	5,108,341	605,780	11,620,186
	{Value	514,000	456,424	52,664	1,023,088
Sugar	{Kilos	2,521,640	1,019,664	14,955,941	18,497,245
	{Value	118,259	43,000	785,941	947,200
Cigars	{Thousand	9,438			9,438
	{Value	128,407			128,407
Cigarettes	{Thousand	1,197			1,197
	{Value	1,423			1,423
Tobacco	{Kilos	597,557			597,557
	{Value	90,658			90,658

CROPS PLANTED AND HARVESTED AND CONDITION OF SAME TAKEN FROM QUARTERLY CROP REPORTS FOR THE QUARTER ENDING MARCH 31, 1911.

By WM. D. HOBART, *Statistician.*

[NOTE.—Attention is invited to the fact that rice should be understood as being in the unhulled state. 75 liters=1 cavan; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba; 0.4047 hectare=1 acre.]

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		<i>Hectares.</i>	<i>Hectares.</i>		
Agusan:					
Rice	Good	364	61	36,450	Liters.
Abaca	do	875	2,543	255,720	Kilos.
Copra	do			17,026	Do.
Corn	do	65	50	75,204	Liters.
Albay:					
Rice	Fair	5,710	22,083	17,839,050	Do.
Sugar cane	do	127	103	31,325	Kilos.
Abaca	Good	76	22,737	4,827,177	Do.
Copra	do			1,257,092	Do.
Corn	do	140	156	108,100	Liters.
Ambos Camarines:					
Rice	Fair	9,211	17,645	19,213,206	Do.
Sugar cane	do	233	198	156,796	Kilos.
Abaca	do	80	16,542	2,002,748	Do.
Copra	do			487,847	Do.
Corn	do	128	86	59,550	Liters.
Antique:					
Rice	do	4	100	75,000	Do.
Sugar cane	Good	5,123	1,579	3,325,823	Kilos.
Abaca	Fair	51	73	16,382	Do.
Copra	do			800,113	Do.
Corn	do	137	154	41,700	Liters.
Bataan:					
Rice	Good	359	3,722	8,863,125	Do.
Sugar cane	do	255	211	254,644	Kilos.
Corn	Fair	9	9	2,250	Liters.
Batangas:					
Rice	do	448	945	965,400	Do.
Sugar cane	Good	7,609	4,801	8,753,419	Kilos.
Abaca	Fair		375	60,783	Do.
Copra	do			9,487	Do.
Corn	do	505	1,601	541,875	Liters.
Bohol:					
Rice	do	9,790	10,318	4,775,625	Do.
Sugar cane	do	177	671	448,993	Kilos.
Abaca	do	1,008	603	134,659	Do.
Copra	do			3,897,971	Do.
Corn	do	1,863	1,494	566,775	Liters.
Bulacan:					
Rice	do	7,136	25,652	28,287,525	Do.
Sugar cane	do	2,660	3,397	5,446,804	Kilos.
Tobacco	do	18	284	107,870	Do.
Corn	do	173	1,150	407,925	Liters.
Cagayan:					
Rice	do	5,559	9,846	10,080,300	Do.
Sugar cane	do	49	106	94,875	Kilos.
Tobacco	do	9,604	3,222	2,106,662	Do.
Corn	do	2,995	3,008	2,659,125	Liters.
Capiz:					
Rice	Poor	829	304	10,932	Do.
Sugar cane	Fair	1,328	521	699,039	Kilos.
Tobacco	do	405	140	24,656	Do.
Abaca	do	280	1,037	415,110	Do.
Copra	do			335,121	Do.
Corn	Good	1,373	353	429,450	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
Cavite:		<i>Hectares.</i>	<i>Hectares.</i>		
Rice	Fair	2,972	7,952	9,580,200	Liters.
Sugar cane	do	1,537	1,741	2,867,838	Kilos.
Abacá	do		600	116,000	Do.
Copra	do			63,250	Do.
Corn	do	205	150	26,325	Liters.
Cebu:					
Rice	do	518	952	1,209,300	Do.
Sugar cane	do	3,536	2,222	421,568	Kilos.
Tobacco	do	4,993	995	398,740	Do.
Abacá	do	89	1,533	940,717	Do.
Copra	Good			1,857,652	Do.
Corn	Fair	14,557	31,447	39,075,075	Liters.
Maguay	do	69	745	211,950	Kilos.
Ilocos Norte:					
Rice	do	4,808	19,670	35,584,900	Liters.
Sugar cane	do	1,918	1,613	1,130,970	Kilos.
Tobacco	do	2,259	66	21,896	Do.
Corn	do	618	236	119,700	Liters.
Maguay	do	51	67	15,246	Kilos.
Ilocos Sur:					
Rice	Good	131	2,831	2,803,275	Liters.
Sugar cane	do	3,536	3,210	7,226,845	Kilos.
Tobacco	Fair	401	190	29,348	Do.
Corn	Good	1,368	1,276	735,300	Liters.
Maguay	Fair	6	1,064	1,217,246	Kilos.
Iloilo:					
Rice	do	4,656	20,583	32,444,450	Liters.
Sugar cane	Good	4,676	2,867	6,309,010	Kilos.
Tobacco	Fair	820	96	26,940	Do.
Abacá	Good	202	312	151,547	Do.
Copra	do			96,772	Do.
Corn	Fair	213	164	160,125	Liters.
Isabela:					
Rice	do	160	465	323,025	Do.
Tobacco	do	24,187	10,513	5,320,216	Kilos.
Corn	do	2,191	1,632	514,650	Liters.
La Laguna:					
Rice	do	2,444	5,770	9,113,925	Do.
Sugar cane	Good	863	810	709,340	Kilos.
Abacá	Fair	2	352	247,813	Do.
Copra	do			1,813,124	Do.
Corn	do	12	176	149,100	Liters.
La Union:					
Rice	Good		1,844	1,246,650	Do.
Sugar cane	Fair	809	814	1,296,680	Kilos.
Tobacco	do	2,947	2,488	852,380	Do.
Copra	do			7,377	Do.
Corn	do	43	338	147,150	Liters.
Maguay	do	1	59	20,479	Kilos.
Leyte:					
Rice	do	5,095	4,987	3,186,225	Liters.
Sugar cane	Good	205	222	127,385	Kilos.
Tobacco	Fair	2,645	72	10,442	Do.
Abacá	do	1,514	28,957	7,025,051	Do.
Copra	Good			1,128,064	Do.
Corn	Fair	3,020	3,120	3,952,300	Liters.
Mindoro:					
Rice	Good	8	39	30,000	Do.
Abacá	Fair		1,512	834,141	Kilos.
Copra	do			14,421	Do.
Corn	do	38	44	14,175	Liters.
Misamis:					
Rice	do	690	820	463,150	Do.
Abacá	do	7	7,031	1,044,131	Kilos.
Copra	Good			1,000,678	Do.
Corn	Fair	83	71	32,700	Liters.
Moro:					
Rice	do	937	750	1,192,050	Do.
Sugar cane	do	46	40	36,052	Kilos.
Abacá	do	139	2,384	1,055,694	Do.
Copra	Good			1,142,228	Do.
Corn	Fair	61	243	140,175	Liters.
Mountain:					
Rice	Good	2,166	737	1,155,000	Do.
Sugar cane	do	174	190	118,530	Kilos.
Tobacco	do	92	26	8,142	Do.
Corn	do	8	70	51,225	Liters.

Crops planted and harvested, etc.—Continued.

Province and crop.	Condition.	Planted during quarter.	Harvested during quarter.		
			Area.	Quantity.	Unit.
		Hectares.	Hectares.		
Nueva Ecija:			30,695	98,219,850	Liters.
Rice	Fair		492	532,122	Kilos.
Sugar cane	Good	717	848	499,560	Do.
Tobacco	do	61	215	98,575	Liters.
Corn	Fair	2			
Nueva Vizcaya:			4,167	5,885,956	Liters.
Rice	Fair	2,102	48	34,091	Kilos.
Sugar cane	do	62	132	77,372	Do.
Tobacco	do	22	119	70,575	Liters.
Corn	do	136			
Occidental Negros:			2,932	3,745,575	Do.
Rice	Good		13,549	63,927,106	Kilos.
Sugar cane	do	25,942	245	180,180	Do.
Tobacco	Fair	157	816	255,783	Do.
Abaca	Good	18		191,774	Do.
Copra	do			267,750	Liters.
Corn	do	334	361		
Oriental Negros:			894	888,000	Do.
Rice	Fair	356	561	4,596,958	Kilos.
Sugar cane	do	1,569	222	85,238	Do.
Tobacco	do	334	501	212,953	Do.
Abaca	do	214		548,704	Do.
Copra	Good			1,518,900	Liters.
Corn	Fair	737	4,002		
Palawan:			10	1,794	Kilos.
Tobacco	do			63,946	Do.
Copra	Good				
Pampanga:			21,337	41,700,525	Liters.
Rice	Fair	11,937	27,880	47,024,980	Kilos.
Sugar cane	do	34,495	110	74,272	Do.
Tobacco	do	50	212	316,050	Liters.
Corn	do	292			
Pangasinan:			21,547	43,954,850	Do.
Rice	do	1,111	3,103	2,408,686	Kilos.
Sugar cane	do	3,603	3,751	1,473,932	Do.
Tobacco	do	5,707		251,229	Do.
Copra	do		834	687,800	Liters.
Corn	do	315	294	291,203	Kilos.
Maguey	Good				
Rizal:			2,113	2,172,075	Liters.
Rice	do	1,195	1,645	1,230,402	Kilos.
Sugar cane	Fair	869	64	19,500	Liters.
Corn	do	233			
Samar:			1,035	693,975	Do.
Rice	do	7,218	223	2,875,825	Kilos.
Sugar cane	do	344	54	9,384	Do.
Tobacco	do	395	5,239	3,231,572	Do.
Abaca	do	801		715,041	Do.
Copra	do		1,602	419,625	Liters.
Corn	do	154			
Sorsogon:			1,626	1,397,825	Do.
Rice	Good	4,748	248	57,051	Kilos.
Sugar cane	do	258	35,403	5,544,052	Do.
Abaca	do	451		180,262	Do.
Copra	Fair		175	226,000	Liters.
Corn	do	224			
Surigao:			25	23,655	Kilos.
Sugar cane	Good	161	3,810	1,058,596	Do.
Abaca	Fair	120		77,861	Do.
Copra	Good			1,500	Liters.
Corn	do	307	4		
Tarlac:			11,992	7,397,700	Do.
Rice	Fair	2,102	3,942	3,678,051	Kilos.
Sugar cane	do	63,623	64	77,786	Do.
Tobacco	do	86	40	72,000	Liters.
Corn	Good	47			
Tayabas:			6,298	2,477,175	Do.
Rice	do	15,277	1,041	962,095	Kilos.
Sugar cane	Fair	905	65	10,948	Do.
Tobacco	do	93	453	203,855	Do.
Abaca	do	87		2,898,368	Do.
Copra	Good		519	198,150	Liters.
Corn	do	169			
Zambales:			5,827	7,656,950	Do.
Rice	do	2,240	171	215,366	Kilos.
Sugar cane	Fair	255		23,276	Do.
Copra	do		25	15,675	Liters.
Corn	do	51			

RANGE OF PRICES OF PHILIPPINE AGRICULTURAL PRODUCTS.

By WM. D. HOBART, *Statistician.**Highest and lowest prices of unhulled rice, abaca, copra, sugar, tobacco, and corn for the quarter ending March 31, 1911.*

[NOTE.—75 liters=1 cavau; 63.25 kilos=1 picul; 46 kilos=1 quintal; 11.5 kilos=1 arroba.]

Province.	Unhulled rice per 75 liters.		Abaca per 63.25 kilos.		Copra per 63.25 kilos.		Sugar per 63.25 kilos.		Tobacco per 46 kilos.		Corn per 75 liters.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
Agusan	3.00	2.25	10.75	6.32	8.85	6.32					5.25	1.50
Albay	4.50	2.25	16.41	5.06	8.22	3.79			20.50	4.60	5.25	1.50
Ambos Camarines	4.50	1.50	7.59	3.79	8.85	3.00			20.00	4.60	3.75	1.12
Antique	3.75	2.25	18.97	9.48	10.75	7.59	9.40	4.43	20.70	4.00	3.00	1.50
Bataan	3.00	2.25									1.50	1.00
Batanes	4.50											
Batangas	3.75	2.25	17.00	8.00	13.91	6.33	9.48	5.00	12.88	6.90	3.75	1.50
Bohol	4.00	1.50	12.65	6.00	10.12	6.32			13.80	9.20	5.00	1.50
Bulacan	3.00	2.25					8.85	6.00	18.40	5.52	3.75	2.25
Cagayan	5.00								19.78	11.50	5.00	2.00
Capiz	3.87	2.25	16.00	11.38	10.00	5.06	7.59	4.42	20.70	4.60	3.75	1.50
Cavite	3.75	1.50	19.78	16.45			8.85	4.43			3.75	1.50
Cebu	4.50	1.65	18.97	9.59	12.86	5.06	9.48	4.43	23.00	4.60	4.50	2.25
Ilocos Norte	4.50	2.50							12.00	4.60	3.00	1.50
Ilocos Sur	6.90	2.00					5.50	4.00	23.00	5.00	4.00	1.50
Iloilo	3.75	2.00	16.44	12.65	12.65	6.00	9.48	5.50	26.00	6.60	5.25	2.50
Isabela	5.00	3.00							28.00	9.66	3.75	1.50
La Laguna	3.00	2.25	9.48	5.69	9.48	5.89	8.85	6.32			3.75	1.50
La Union	5.25	1.50	15.81	6.32	15.81	9.50	8.85	5.00	22.35	6.84	3.75	2.25
Leyte	3.50	2.00	13.91	4.80	10.12	3.80			20.65	5.00	5.25	1.20
Mindoro	3.00	2.25	13.91	7.59							2.50	2.00
Misamis	3.75	2.25	12.00	3.80	10.75	3.00	9.48	6.32	23.00	4.60	5.00	1.50
Moro	3.00	2.10	12.00	5.69	8.50	6.95					3.00	2.25
Mountain	6.00	2.25					9.48	4.50	23.00	2.84	6.00	1.75
Nueva Ecija	3.75	1.50					9.50	5.73	27.60	6.90	4.50	1.12
Nueva Vizcaya	4.16	2.50							26.40	11.00	3.75	2.00
Occidental Negros	3.25	2.50	18.97	10.00	12.00	5.06	8.85	5.06	23.00	6.50	4.12	2.00
Oriental Negros	5.00	2.25	15.81	6.32	10.75	6.95	6.95	5.06	25.30	9.00	5.25	3.75
Palawan	3.00	2.00										
Pampanga	3.37	1.50					9.00	4.43			4.50	2.25
Pangasinan	4.50	1.50					10.12	6.00	17.94	6.44	4.50	1.50
Rizal	3.37	2.25					9.48	5.00	18.40	11.50	4.50	1.68
Samar	5.00	2.62	13.50	6.32	11.38	3.80			27.60	3.00	4.50	1.50
Sorsogon	3.75	2.25	15.81	7.00	11.00	6.95			13.80	9.20	3.75	1.50
Surigao	4.50	3.00	15.81	6.32	10.12	7.59			27.60	3.00	2.50	2.00
Tarlac	4.50	1.50					9.48	5.70	9.66	4.60	2.25	1.50
Tayabas	5.25	1.25							18.40	3.00	3.75	1.50
Zambales	4.50	1.87	16.00	6.00	8.85	3.24					4.50	2.25

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES— JUNE AND JULY.

By the DIRECTOR OF THE WEATHER BUREAU.

JUNE, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	28.7		26.3	16.7	27.5	0.5	27.8		28.5		28	
2	27.3	2.3	26.5	6.4	26.5	14.2	28.5		29.1		29.2	
3	28.5	2	27	13.2	25.5	12.5	28.2		29.1		28.4	1.8
4	28.5		26.8	5.8	26.7	3.3	29.6		28.6		28.4	2
5	28.5	4.8	27.2	24.8	27		29.1		28.4		27.8	
6	28	3.3	27.1		27.3		29.3		28.1		28.8	
7	28.3	1.5	27.4		28.4		28.6		28		28.9	
8	28.4		28	2	26.9	6.4	29.6		28.8		29.2	
9	28.2	11.9	28.5		27.7		30.4	1.0	29.2		29.8	
10	28.9	13.5	26.8	4.6	27	25.9	30.7		29		27.6	.3
11	27.7	4.4	27.7	1.5	27.4	4.1	30.3		28.1	1.3	27.9	6.6
12	28.7	1	27.1	2	27.1	4.9	30.1		28.2		28.4	.8
13	27.1	4.5	27.3	32.5	26.7	28.2	30		28.7		29	51.6
14	27.2		27.4		27.6	1.8	27.8	5.1	28.7	22.4	28.3	3
15	28.4		28.4		28.1		28.6	3.3	28.7		28.8	.8
16	27.4	13.7	28.1	8.9	27	1.6	27.4	6.1	28.8		25.6	29.4
17	27.9		27.6	5.3	27.8	22.4	27.9	13.2	28.3		25.8	52.1
18	26.8	11	27	4.6	25.6	40.4	28	5.1	28.3	3.8	27.3	.8
19	26.5		27.3		24.2	47.7	25.7	25.7	26.4	21.6	27.1	17.8
20	27.3		28.2		26	3.3	25.7	3.5	28		27.2	4.1
21	28.2		28.1		26.9		26.8		28.1		27.6	5.6
22	28.2		27.1	1	26.9		28		28.9		27.6	
23	28.4		27.2	2	26.2	.8	29.4		29.3		27.7	
24	27.7		27.2		26.4		30		29		28.2	51.6
25	28.1		27.2	12.2	26.6	22.6	30.6		29.2		27.8	
26	27.9		26.9		26.4		28.2	8.4	29.2		28.4	
27	27.2	1.1	25.9	13.8	26.4	1.3	27.8	11.4	29.2		28.1	
28	27	5.1	26.8	1.3	26.8		28.2	13	28.2	2.3	28.3	9.1
29	26.6	3.6	26.7	10.2	26.5	1.6	28.8	15.5	27	18.8	26.8	38.1
30	25.1	70.9	24.7	14.7	25.2	10.4	28.8	.5	28	13.9	26.6	21.6

JULY, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1	24.3	52.6	25	13.1	24.6	69.1	27.9	19	27.7	5.4	25.6	32.3
2	27	3.8	25.8	13	25.6	6.9	24.5	50	28.3	---	25.4	21.3
3	27.9	---	26.2	1.5	27.5	---	27.2	.8	28	---	27.4	---
4	28.3	---	26.6	8.1	27.6	19.8	27.5	48	26.6	44.2	28.2	4.1
5	26.9	2.6	26.4	---	26	2.5	27.9	2.5	26.7	---	27	---
6	28	.3	27.7	---	26.9	---	28.2	---	27.6	---	26.4	---
7	28.6	.3	27.8	6.3	27.1	4.8	29.4	---	27.6	---	28.2	---
8	27	1	25.9	16	26.4	.8	28.2	---	28.3	---	27.9	---
9	27.5	26.9	28.1	---	27.3	---	29.6	21.6	28	---	28.2	32.8
10	27.5	17.3	27.8	---	28.2	---	29	4.3	27.7	---	26.9	---
11	27.1	---	28.1	38.1	27.4	---	28.1	---	28.4	---	28.2	---
12	25.8	51.8	24.6	68.8	26.5	15.2	29.2	---	28.2	18	27.8	---
13	24.2	129.8	25.4	2.5	25.1	14	28.8	4.1	26.6	57.6	---	34.3
14	26.3	3.1	27.8	17.3	26.5	32.8	24.6	69.1	26.6	36.1	---	154.5
15	27	3.1	28.2	---	28.4	12.2	23.8	57.9	24.1	47.2	---	101.9
16	27.7	1.1	26.7	.8	27.2	24.6	23.8	78.7	23.6	18.9	---	84.1
17	27.7	1.3	27.8	---	26.8	33.9	24	111	25.2	---	---	73.7
18	27	---	27.3	---	26.3	1.3	24	25.6	25.2	19	---	9.4
19	26.8	.5	27.8	---	25.9	.5	25.2	2	26	9.4	---	---
20	27	1.5	27.5	---	26.6	26.9	27	3.8	26.7	---	---	24.9
21	26.9	.8	26.2	11.4	25.9	46.5	24.1	61.5	27.2	---	---	.8
22	26.7	2.4	27	---	27	49.2	24.8	67.8	27.8	---	---	17.3
23	26.5	3.3	27.8	3	26.6	133.6	23.7	118.9	27.4	53.1	---	107.8
24	27	.3	28.1	1.3	25.8	130.9	25	34.8	26.5	1.1	---	158.6
25	28.1	---	29.3	---	27.2	4.8	26.4	7.1	27	16.2	---	112.8
26	28.2	---	29	---	26.8	54.2	27.6	5.6	27.1	.8	---	37.4
27	---	1.5	28.1	3	26.7	.8	27.9	4.3	27.2	75.4	---	1.3
28	27.1	---	25.7	23.1	26.4	.3	27.4	---	27.1	---	---	9.7
29	25.9	---	26	---	25.7	22.3	28.8	57.7	27.8	---	---	4.3
30	26.3	2	26.5	.8	26	1	28.5	59.7	28.2	.5	---	3.6
31	26.4	3.8	26.8	2.5	25.2	49.6	25.6	9.1	26.3	103.7	---	52.1

**MISSING
PAGE(S)**



PLATE I.—TIMOR COW.

(Probably *Bos banteng*; note false dewlap 4 centimeters deep from brisket to navel.)

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EDITORIAL.

THE NEW DIRECTOR OF AGRICULTURE.

On October 16, 1911, Mr. F. W. Taylor, of Denver, Colorado, assumed the duties of Director of Agriculture.

Mr. Taylor was for some years, beginning in 1891, professor of horticulture at the University of Nebraska and at the same time in charge of all the university extension work—including

farmers' institutes—in that state. From 1897 until 1905 he was connected with the Omaha, Buffalo and St. Louis Expositions as chief of the agricultural and horticultural exhibits. These departments at St. Louis covered 26 acres (10.5 hectares) of floor space, more than one-fourth of the entire exhibit space in the exposition. Exhibits were maintained by all but two or three of the States and Territories of the Union and by forty-four foreign countries. In assembling the exhibits for these various expositions Mr. Taylor visited every State in the Union and also a number of foreign countries; in addition, he has traveled very widely in the investigation of agricultural conditions—with special reference to horticulture—in many countries, including Mexico and practically every part of Europe.

For the last five years Mr. Taylor has devoted all of his time to agricultural work in the arid regions of the West with particular reference to irrigation. Two projects, of which he has had the management, have spent several million dollars in irrigation construction, resulting in the reclamation of more than 200,000 acres (80,940 hectares) of land.

SOME PHASES OF THE PROBLEM OF IMPORTATION OF CATTLE INTO THE PHILIPPINES.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

The possibility of importing cattle diseases with the effect of undoing the results of disease eradication in the Philippines is a danger that menaces all efforts to provide beef and draft cattle. The cattle importation business is largely carried on with the mainland of Asia and adjacent islands, together with Australia, on account of their proximity. The Sisiman stockyards and matadero described in the October issue of the REVIEW seem to have disposed of the problem of arranging for an inexhaustible supply of beef cattle from Australia for the Manila market.

It is necessary, however, to look elsewhere for sources from which to supply the demand for draft animals and beef for slaughter in the provinces.

Indo-China has for years been the main source from which were drawn carabaos, and more recently, the main source of draft and beef cattle. In view of the existence of foot-and-mouth disease and rinderpest there, the importers have shown a remarkably good record in bringing in healthy cattle. Some months ago several shipments arrived infected with foot-and-mouth disease, and after the discovery of this, all importations ceased.

The great importance of this trade to the Philippines led this Bureau to send Dr. D. C. Kretzer to Indo-China for the purpose of arranging, if possible, different methods in handling animals so as to avoid their becoming infected.

Doctor Kretzer found that, in accordance with local regulations, all cattle were embarked at Pnum Penh, Cambodia. This place was found to be infected at the time of his visit, as it had been at the time of shipment of the last infected cargo imported from there. It had been the custom to gather cattle and carabaos in small groups in the interior and later to transport them to Pnum Penh for shipment. Enough of such cattle were congregated at various points to load several steamers,

but the existence of foot-and-mouth disease in Pnum Penh prevented the owners from taking them there for shipment where they would surely be exposed.

Cambodia is plentifully supplied with rivers navigable for cattle ships and nothing but the local regulations prevented the direct shipment of these animals from the interior without exposing them in the city of Pnum Penh. Doctor Kretzer took this matter up with the French authorities, pointed out the necessity of avoiding Pnum Penh, and succeeded in obtaining permission for direct shipment. He further arranged to have export animals gathered in the future upon several islands in the river above Pnum Penh which have grazing facilities sufficient to support 1,500 to 2,000 cattle for the time necessary to gather that number and await turn for shipment. The use of several islands prevents the concentration of more than one cargo of animals on one island, and thus, should diseased cattle be found in a herd, the infection would be restricted to one cargo. This arrangement offers the best conditions for bringing healthy animals from Indo-China and it is hoped that it will continue to work well, in view of the fact that the importation of carabaos from that country is a matter of vital interest in the agriculture of the Philippine Islands.

Cambodia has been, and probably will be, the chief source of animals imported into the Philippines from Indo-China. However, one dealer is considering the matter of exporting cattle from the port of Touraine in the protectorate of Annam, and has permission from the government to take out 5,000 head.

Hongkong, owing to its close proximity to Manila and good transportation facilities, has been the chief port along the China coast from which cattle were exported to the Philippines. The condition of shipments from this port was indescribably bad during the time the trade was permitted. Data are herewith presented covering the last eighteen months of importation, July 5, 1909, to December 2, 1910, after which importation was in effect prohibited by requiring a three months' quarantine at Manila.

One hundred and seventy-three shipments were imported during this period of eighteen months. Of these, 110 shipments showed foot-and-mouth disease alone at inspection on shipboard; 5, rinderpest alone; 8, both rinderpest and foot-and-mouth disease; 26 shipments were designated "exposed" and were quarantined on lighters. The designation of such shipments as exposed was necessary to prevent the landing of the shipments in case no disease was detected during inspection. Otherwise, infected shipments might have escaped detection as there was no

authority for quarantine unless regarded by the Director of Agriculture as exposed. Many of these "exposed" shipments developed disease during the quarantine. After June 1, 1910, direct authority was available for quarantining shipments on lighters. Between this date and the practical prohibition of importations from Hongkong 24 shipments were imported, of which 22 were found free from disease after ten days' quarantine.

An investigation was recently made of conditions in Hongkong by Dr. P. H. Burnett. The following quotation from his report goes far toward explaining the reason for the excessive number of infected shipments received from that port:

Hongkong, in itself, is nothing more or less than what might be properly termed a "cattle exchange." As cattle are not produced in the colony, they must all be imported for slaughter and exportation.

The source of supply is mainly the interior of China, with a small percentage from French Indo-China. As to conditions at the different sources of supply, will say that they naturally vary, and in most cases are unknown to the Hongkong officials, which is of no importance, as there are no questions asked regarding the health conditions of animals in the localities from which they are shipped, nor the actual condition of the animals questioned before they are allowed to be unloaded in Hongkong.

The Government does not attempt to control the source of supply, nor even prohibit the entrance of animals from districts known to be infected with rinderpest or other contagious animal diseases. They have no stock-raising interests, and will give absolutely no guarantee that Hongkong will remain free from contagious animal diseases from one day to the next.

I was unable to gather reliable information, during my short stay, as to the prevalence of animal diseases in any certain section of the country, but as the Chinese Government has made no attempt to collect data, fight or control animal diseases, it is plausible to believe that conditions to-day are the same as they have been in past years.

The foregoing considerations lead the writer to conclude that Hongkong cannot be relied upon as a source of healthy cattle. As progress is made in eradicating foot-and-mouth disease and rinderpest in the Philippines the risk of incurring dangers from importation will become more and more inexcusable in the future.

It is necessary, however, to face the fact that the importation of draft and breeding animals should be restricted as little as possible. It is believed that such animals can be introduced with greatest safety when immunized in Hongkong by the method of simultaneous immunization applied by a veterinarian of the Bureau of Agriculture. The process, when applied to animals free from foot-and-mouth disease, need not be attended with such a death rate as to prevent the commercial success of importing such animals. The introduction of foot-and-mouth disease among animals being immunized by simultaneous im-

munization would be a disastrous accident. A consideration of the conditions attending the introduction of animals into Hongkong leads one to conclude that the risk of the introduction of foot-and-mouth disease is a serious one. Attention is being given to the matter of affording opportunity for the importation of dairy and breeding stock from Hongkong after such immunization. It is to be hoped that the scheme will prove practicable, since every animal so imported will become a permanent asset to the agriculture of the Islands through its immunity against attack by rinderpest.

Importation of cattle and carabaos from Timor has been begun only recently. Dr. J. A. Thompson accompanied the first vessel proceeding to Timor for cargo for the purpose of gathering information for this Bureau about live-stock conditions in that territory. He did not find evidence of contagious animal diseases in the island. The carabaos of Timor are believed to be indigenous there and there is no record that any have ever been imported. Immense herds are maintained by native chieftains as an evidence of wealth, though there seems to be very little desire to sell, and it is estimated that about 2,000 carabaos could be available for exportation each year. They cost in Timor from ₱20 to ₱40 per head, depending upon the locality.

The original stock of cattle is said to have been imported from Java many years ago, but none have come from there during the last ten years. These animals (*Bos banteng*) are interesting in that they belong to a different species of cattle from those with which we are familiar in the Philippine Islands. They are more or less wild and are never broken to the plow.

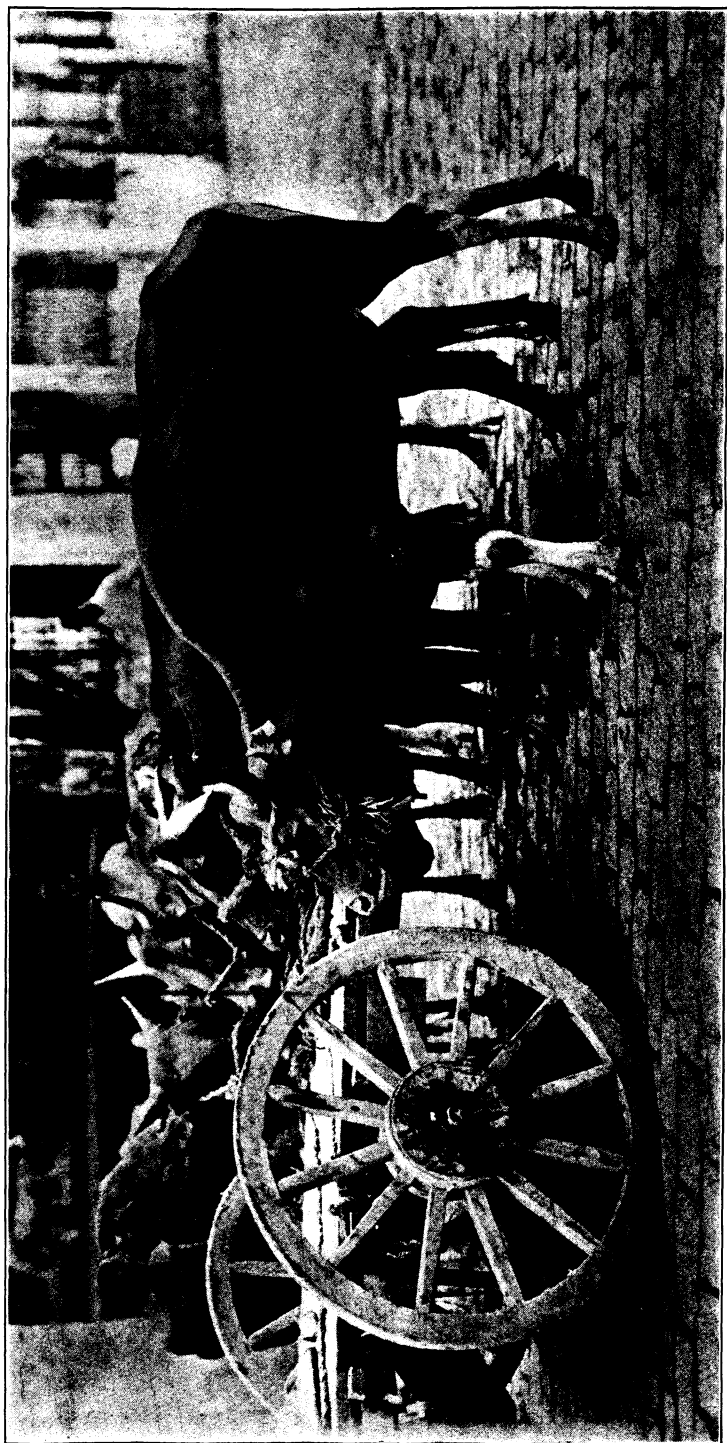


PLATE II.—TIMOR CATTLE.

(Probably nearly full-blood *Banteng*; old bull in foreground, three cows and one bull in background.)

WARNINGS TO RUBBER PLANTERS.

By O. W. BARRETT,

Chief, Division of Experiment Stations.

In the belief that no good can result from withholding bad news, and also that "being forewarned is being forearmed," we feel it is incumbent upon us to issue a warning to importers of Pará rubber stumps in regard to the possibility of introducing the "brown root rot" disease (*Hymenochæte noxia* Berk.) from the Malay States. What is believed to be this very fungus has recently made its appearance in at least one plantation in the Philippines and its virulence seems to be as great here as in the Malay States, since it kills the Pará trees coming in contact with it in apparently a very short space of time.

Judging from the circumstances it would appear that the fungus in the sole case coming under our notice was a strictly local or spontaneous affair, though we hesitate to state that this disease is really endemic here. It is more or less common in both Ceylon and Malaya and is probably causing considerable damage both in the Samoa rubber plantations and in West Africa. Fortunately it is a contact fungus; that is, it spreads from one root directly to another without traversing more than a very short space, if any, in the soil itself; if it should also produce spores on trees long dead from its attack, such spores might, of course, spread widely and cause very extensive damage if they found a congenial lodgment.

Any stump or seedling plant of Pará rubber coming into the Philippine Archipelago from Ceylon or Malaya giving the slightest indication of a grayish brown decaying area should be burned at once, and all plants in contact with it should be thoroughly disinfected. Either the taproot or the feeding roots may become first infected and in the nursery or seed bed the plants may show no symptoms of the disease until the crown becomes affected, at which time the plant begins to shed its leaves; within a week or so from the time of the cutting off and poisoning of the sap supply at the base of the trunk, the tree may be dead.

Another disease against which Pará importers should guard is the "dieback" (*Thyridaria tarda* Ban.); this is a wound disease, and would be in evidence around the top of the stump or in cuts on its base. Still another is the so-called "pink fungus" (*Corticium javanicum* Zimm.) which affects Pará, tea, and other plants in India and Ceylon. This fungus attacks the trunk usually at the fork of the branch and may be easily identified by its pinkish color.

Thus far all Pará plants in the Philippines seem to be free from leaf diseases, but a close watch should be kept by planters and prompt steps for the destruction of any leaf-blight, as soon as evident, should be taken.

The common Fomes disease, though a very serious matter in Malaya, is nothing to be frightened about thus far in the Philippines; this fungus spreads only in wet or badly drained soils. It is probably more or less common throughout the Oriental tropics; if not promptly attended to in a plantation it can cause very heavy losses.

There is comparatively little risk of introducing the germs of these fungi on seeds, although, of course, there would be considerable danger if soil were used in packing.

We take this opportunity to call attention to the fact that Pará seeds coming from Singapore and any of the Malay States should *not* be packed in fresh charcoal. Charcoal which has not been "*weathered*" is almost "*sure death*" to any seed which does not endure drying out, and a great amount of valuable material has been lost in recent years through ignorance or carelessness on this point. By far the best material for packing Pará seeds is coconut-husk dust, in a "*tobacco moist*" condition. Seeds can easily be kept for six months in this material whereas they would probably not endure more than six days in charcoal. As a substitute for coconut-husk dust, sawdust or sphagnum moss may be used, but care should always be taken that there is no excess of moisture. It must be remembered that all live seeds breathe, especially those which do not immediately become dry after maturity, and allowance should be made therefor by means of ventilating the packing case.

The fatal effects of charcoal upon the seeds are due to the fact that fresh charcoal has the property of condensing gases on its surface, and since even a small lump of charcoal has really a tremendous area of surface (on account of its porous cellular structure), we can understand how the vital gases in a box of seeds can be practically removed and the normal respiration processes inhibited thereby.

ANOTHER MANGO PEST IN THE PHILIPPINES.

By P. J. WESTER, *Horticulturist*.

In the June, 1911, number of the REVIEW the writer communicated the discovery of the presence in the Philippines of two insect pests, one of a particularly serious character that "blights" the mango bloom. It is, therefore, with great reluctance that he now calls attention to another pest, that might become no less destructive, and which attacks the partly developed and nearly mature fruit. This pest has been found in four provinces in Luzon, and if not identical with, is a very near relative to *Dacus ferrugineus*, so destructive to the mango in Java and other parts of Malayasia, and is also related to *Trypeta ludens* which, in Mexico, attacks the mango, orange, and guava.

The attention of the writer was first drawn to this insect during a visit, May 13, to the Lamao experiment station, Bataan, where he was attracted by the unusual number of "drops" under the mango trees growing at the station. An examination of the fruit, both on the trees and on the ground, disclosed numerous fruits on the trees in different stages of development having one or more minute cavities caused by the eating out, by some insect, of a little of the epidermis and flesh of the fruit—some probably a week or more old, others freshly made. In most cavities were found deposited one to several slender, white eggs, about one millimeter long, the surrounding flesh, in the older cavities, having begun to decay. Eggs were also found in injuries caused by the rubbing of fruits against branches of the tree by the wind, or small cracks due, perhaps, to the heavy summer rains and rapid growth of the fruit; but, though a careful examination was made of numerous fruits, in no instance were larvæ found in fruit which was still on the tree. The decaying fruit on the ground was riddled by myriads of whitish maggots which devour only the flesh of the fruit; a few large, red-banded lepidopterous larvæ were discovered inside the horny covering of the seed, feeding upon the kernel. One fully grown

fruit was picked from which the larva, after having devoured the seed, had made its way out of the fruit to pupate. This latter insect hardly appears in sufficient numbers, thus far, to be called a pest.

Later the writer has had occasion, in connection with his mango-breeding work, to visit several of the mango-growing districts of Luzon. The hogs, kept by the natives, clean up all "drops," and in most places it is, therefore, difficult to find any fruit on the ground. At Imus, Cavite, apparently sound fruit was picked from trees and brought to Manila that on ripening was found to be swarming with maggots identical with those found at Lamao. In the mango orchard of McCondray & Co., in Muntinlupa, Rizal, an adult fruit-fly was discovered on a bunch of mangos, and in Pulilan, Bulacan, many were seen in a grove of bearing trees; ripening fruits were here picked from the trees, as well as in Muntinlupa, and found to be infested with maggots, for which this fly is probably responsible. The injury to the crop in Muntinlupa from this pest did not appear to be serious, but in Lamao the loss was conservatively estimated to be not less than 15 per cent of the crop.

In connection with the above the following excerpt, from an unpublished manuscript prepared by the writer on the culture of the mango, may be of interest:

Perhaps the most serious insect pests of the mango are the fruit-flies, of which three species are particularly conspicuous; the Mango fruit-fly (*Dacus ferrugineus* Fabr.), the Queensland fruit-fly (*Dacus tryoni* Froggatt), and the Mexican fruit-fly (*Trypeta ludens* Loew).

The mango fruit-fly is found in India, Java, Ceylon, and Amboina, where it is very destructive to the mango and probably occurs in many other islands in Malayasia. The species also infests the orange and other fruits.

The Queensland fruit-fly ranges from India and Ceylon to Java, Amboina, and Australia (in Queensland and New South Wales). It is commonly a mango pest but is also destructive to bananas, oranges, peaches, and other fruits. Both these species, in the adult stage, are small, active flies that lay their eggs on the fruits, into which the larvæ burrow rendering them unfit for consumption. Having attained their full size the larvæ leave the fruit and pupate in the ground. The fruit-flies have been reported to be especially destructive to the mango in Java; over 50 species of the genus *Dacus* have been described from Malayasia, and it is probable that several of these, beside the two species that are particularly conspicuous mango pests, are more or less injurious to the mango.

The Mexican fruit-fly appears to be the only serious mango pest in the Western Hemisphere. This insect is thought to be of South American origin but it is its attacks on the mango, orange, and guava in Mexico (chiefly in the state of Morelos) that has made it known as a serious insect pest. The small fly lays the eggs under the skin of the nearly ripe fruit and the larvæ destroy it in the same manner as do the larvæ of the other fruit-flies. The larvæ usually leave the fruit and pupate in the

ground, although occasionally the chrysalis stage is passed inside the fruit. The fact that all the species enumerated infest other fruits than the mango renders them the more dangerous and correspondingly difficult to control.

Remedies: The fruit-flies may be controlled, to some extent, by gathering and burning all "drops" and refuse fruits before the larvæ leave and enter the ground to pupate. In Mexico, in the warfare against the Mexican fruit-fly, the predilection of these insects for sweets led to the experimentation with a spray made from the decoction of a poisonous herb, *Haplophyton cimicidum* A. D. C., sweetened with sugar and sprayed on the infested trees. The spray is prepared by boiling 1 kilogram of the herb, cut fine, in 10 liters of water, straining the infusion and dissolving in it 1 kilogram of sugar. The remedy was found effective and where the herb is found in abundance it may be used to advantage in the control of the pest.¹

The spray, of which the formula is given below, has been found very effective by C. W. Mally, in South Africa, in combating the Mediterranean fruit-fly (*Ceratitis capitata* Wied), so destructive to the fruits of that country, and there is every probability that it would, on trial, be found equally effective in the destruction of all the fruit-flies affecting the mango, provided that they are attracted to sweet substances as are the Mediterranean and Mexican fruit-flies. In the course of his experiments with this spray Mally found that the percentage of infested fruit dropped from 50 per cent in unsprayed trees to 1 per cent in those that were treated. Bees are not attracted by this bait and there is no danger of poisoning from eating the fruit from the sprayed trees.

Mally recommends that the first application be made a month before the presence of the larvæ in the fruit is expected and thereafter an application every ten to fourteen days is thought advisable. The aim should be to have the poisoned bait on the trees as long as the flies are present in the orchard. A comparatively small amount of the spray is applied to each tree, or about 1 to 1.5 liters to a tree of about 6 to 7.5 meters spread.

In applying the spray, the nozzle should be directed so that the liquid falls in small drops over and through the trees.²

Besides the poisoning of the adult flies, their liking for certain oils may be used in order to trap and destroy them. *Dacus ferrugineus*, in this way, may be attracted by citronella oil; and *Ceratitis capitata*, by kerosene.³

These traps consist of shallow pans filled with water, over which a small amount of oil is poured, placed in the fly-infested orchards.

FORMULA OF THE MALLY FRUIT-FLY REMEDY.

Arsenate of lead	kilograms....	0.6
Sugar	do.....	7.5
Water	liters....	100

Dissolve the arsenate of lead in a small quantity of water, dilute to 100 gallons and add sugar.

¹ Cooper, Ellwood, *Trypeta ludens*, in Mexico, 1905, p. 31.

² Agricultural Journal, Cape of Good Hope, 1909, vol. 34, pp. 620-633; vol. 35, pp. 578-581.

³ W. W. Froggatt, Farmers' Bulletin No. 24, Department of Agriculture, New South Wales, 1909, pp. 7 and 8.

If it is desired to prepare the spray from the ingredients used in the manufacture of arsenate of lead, use the following formula:

Arsenate of soda	grams....	180
Acetate of lead	do.....	450
Sugar	kilograms....	7.5
Water	liters....	100

Dissolve the arsenate of soda and the acetate of lead separately, in wooden or granite vessels, in 4 liters of preferably hot water. When dissolved, pour the contents of the two vessels simultaneously into the sugar solution.

Should the fruit-fly referred to appear in such numbers as to become a pest in the mango-growing districts in the Philippines, the remedies discussed above are recommended for its control.

The Bureau will make a study of the life history and habits of the insect and the extent of its spread throughout the Archipelago, particularly in those districts where mango growing is one of the more important industries.

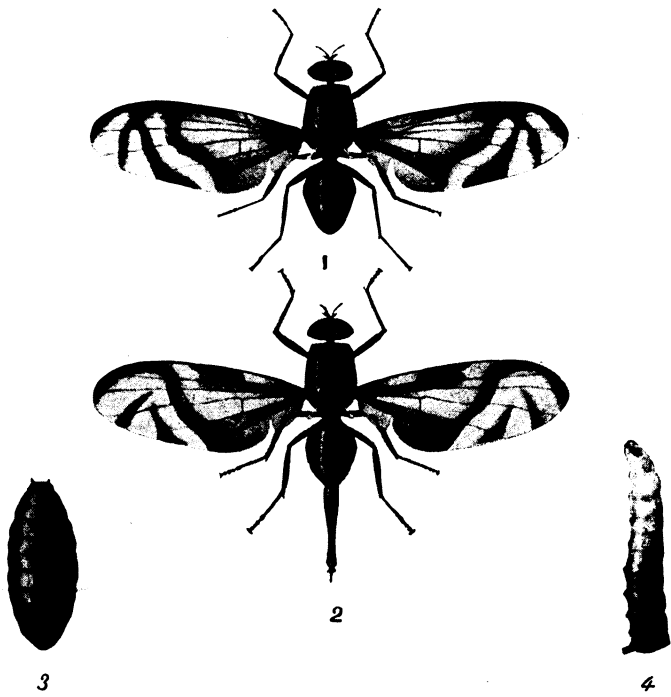


PLATE III.—MEXICAN FRUIT-FLY (*Trypeta ludens* Loew). (1) male adult;
(2) female; (3) pupa; (4) larva.

Reproduced from a colored illustration in *Trypeta ludens* in Mexico, by Ellwood Cooper.

A NEW METHOD OF CONTROLLING TERMITES THROUGHOUT THE TROPICS.

From notes furnished by D. B. MACKIE,
Agricultural Inspector.

The various species of white ants, or termites, constitute one of the most serious insect pests on cultivated estates in the Tropics. In some countries only dead wood is attacked while in others even living plant tissues are devoured, especially in case of the temporary scarcity of decaying timber; for instance, immediately after the clearing of a forest area. The damage to live plants is usually comparatively insignificant as compared to the destruction of timber, wooden implements, etc., about estate buildings. Even in places as far north as Washington, D. C., U. S. A., certain species enter houses and destroy books, furniture, etc.

Attempts along the line of rendering timber used in the construction of buildings, etc., obnoxious or impermeable to termite attacks have been carried on for the last decade or more, but it is only within the last few years that a really scientific method of directly combatting the pest itself has been worked out. Of course, timbers can be soaked in tar, creosote, or any number of chemical preparations, thus protecting the material from the pest. Moreover, it is a fairly simple, though not always effective plan, to destroy the queens of the species which construct nests of earth for the rearing of their young; however, since it is almost impossible to destroy an entire colony, even by the use of kerosene, arsenic, or carbon bisulphide, this method has been rather unsatisfactory.

It has long been known that termites are particularly sensitive to arsenic and at the same time are very easily killed or driven away by either arsenical baits, or by white arsenic itself deposited in the galleries of the nest. In order to make the destruction of the colony complete, then, it is only necessary to carry arsenic, in some form, throughout the nest and all of the galleries leading to it. It is now known that the vapor of white arsenic and

sulphur burned together in a suitable receptacle and introduced into the nest, or even one of the main galleries leading thereto, will permeate the entire structure of the colony leaving a poisonous deposit throughout the course of the fumes, and at the same time immediately killing nearly all of the insects by suffocation. All that is required is a metal box of some sort, which can be readily heated from beneath, connected with a flexible tube which can be inserted into the nest, or main gallery. The lid of the box should, of course, fit tightly and there must be some sort of a pumping apparatus to force the fumes out of the poison chest through the flexible tube and to the extremity of the smallest gallery, even if it be 20 meters from the central nest. Machines are now on the market at a reasonable price for performing this operation. The principle is the same in all; that is, a charcoal-burning stove carrying a fume chamber on top forms one piece and a hand pump, which forces air into the fume chamber—thus driving the fumes into the nest—forms the second piece. Rubber tubing connects the pump with the main apparatus and at the end of the hose leading from the fume chest is a metal point for thrusting into the hard structures of the nest.

About three parts of sulphur to one part of arsenic is the best combination of the fume substances; the heat of the charcoal is sufficient to vaporize both the sulphur and arsenic and these vapors combine more or less forming arsenic trisulphide which is deposited throughout the galleries of the nest and also upon the individual insects. A nest so treated is probably never again habitable by any colony that might attempt to annex the abandoned structure.

The operation of this fume apparatus is exceedingly simple, there being but few chances for a mistake to be made in its manipulation. It should be remembered, however, that moist clay, or something similar, should be placed around the nozzle of the fume hose at the point of its entrance into the nest, gallery, or infested timber; this air-tight packing will prevent the escape of the fumes. In the case of ground infested by termites whose nests are not plainly in evidence, a rod may be used to make an opening into the earth wherein the galleries are suspected to be situated. Except in very heavy soil these artificial galleries generally break into one or more of the termite tunnels and thus the fume hose inserted into the hole made by the bar or stick will convey the fumes to the nest and galleries within a reasonable distance therefrom.

Five minutes of pumping is generally sufficient to impregnate the nest and galleries with the fumes. In the case of beams or large timbers in buildings suspected of being infested with termites, a small auger may be used to explore the interior of the wood; when a gallery is located all that is necessary is to attach the apparatus, pack the point of entrance of the hose nozzle with mud and pump in the poison.

A heaping teaspoonful of the poisoned mixture is usually sufficient for treating an ordinary nest. It should be remembered that the insects are not all immediately killed no matter how thorough the fumigation, but if the operation is well performed no insect should be in evidence after a period of forty-eight hours. This is explained by the fact that death is caused not entirely by asphyxiation but probably by the irritant action of the arsenic as well.

One of these machines, which are now procurable in Manila, should be in the hands of every estate owner who suspects the presence of this usually invisible but really very serious insect enemy.

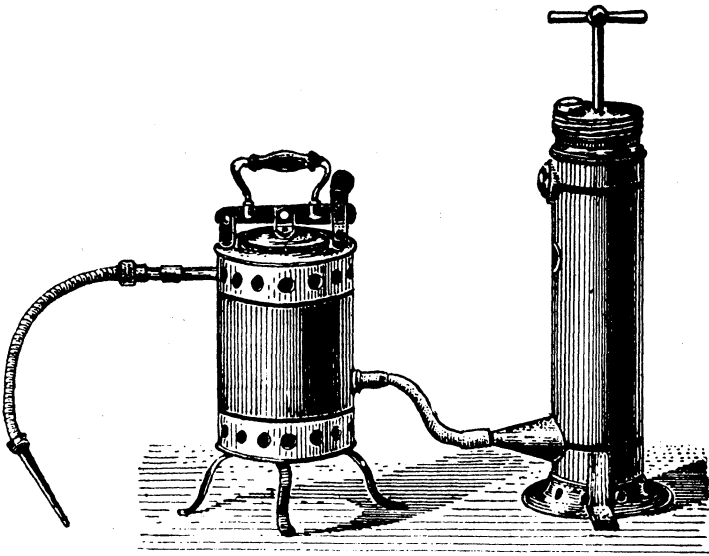


FIG. 1.—Pump, fume chest, etc., used for destroying termites.

RINDERPEST ON KABARUYAN ISLAND.

From report by Dr. C. H. DECKER.

Kabaruyan Island, about 25 kilometers long by 15 wide, is situated in the western part of Lingayen Gulf, and forms part of the Province of Pangasinan. The chief industry of this island, on account of its rolling surface and an abundance of forage, is stock raising, especially cattle, which are exported to other parts of Pangasinan, and sometimes to other provinces as well.

In connection with the recent outbreak of rinderpest in Kabaruyan, and its subsequent eradication, the following facts may be of interest to readers of the REVIEW.

During the early part of April, 1911, a number of carabaos, which had been rented by residents of Alaminos from their owners on the Island, were returned to these owners, carrying back to Kabaruyan with them a very virulent form of rinderpest which was then raging on the mainland of Pangasinan.

On the appearance of the disease, the Bureau of Agriculture was notified, and Mr. J. J. Miller was sent to investigate conditions. As the infection seemed to be confined to the northern part of the Island, Mr. Miller requested that a double fence be built across Kabaruyan to prevent the large herds in the southern part from becoming infected. Soon after the completion of this fence, Mr. Miller was relieved by Mr. B. J. Egan, who soon discovered that infection was appearing in the territory south of the double fences. As this showed that a serious outbreak was under way, Dr. Chas. H. Decker was placed in charge. Doctor Decker found that the disease was rampant in all parts of the island, the animals dying at the rate of 140 a week.

Owing to the fact that the animals were in a semiwild state, the usual method of tying in situ could not be resorted to, and it was also extremely difficult to collect them so that the owners could furnish the necessary food and water. The problem was solved, however, by each owner fencing in his own animals in places having a natural supply of both food and water. With

the aid and under the direction of Bureau inspectors, the municipal president, and Constabulary soldiers, this was soon done.

In cases where the haciendas were distant from the rice fields, small corrals were built near the latter and the animals were guarded by Constabulary soldiers while en route thereto; they were also guarded night and day while work was going on, as well as during their return to the haciendas, thus preventing contact with other animals or exposure to other sources of infection. By this method rinderpest was eradicated from the island, and on September 14, 1911, the quarantine was raised.

The campaign was remarkable in several ways; considering the virulent form of the disease, and the susceptibility of the animals thereto—due to the fact that the island had been free from rinderpest since 1888—the percentage of deaths was small; the disease had become widespread before an organized force was placed on the island; the campaign as a whole was very inexpensive, due to the fact that the people of the island gave their services without pay, and to the fact that the Filipino inspectors received but half the salary usually paid to them, without traveling expenses.

The campaign plainly shows the advantages of having all animals fenced in so as to prevent the infected herds from coming in contact with the noninfected herds, and also shows that with the good will of the municipal officials and the people as a whole rinderpest even of the most virulent type can be stamped out of a locality.

A summary of the number of cases, deaths, and recoveries for each month follows:

Period ending—	Cases.		Deaths.		Recovered.	
	Cara-baos.	Cattle.	Cara-baos.	Cattle.	Cara-baos.	Cattle.
April 29, 1911	111	48	51	29	0	0
May 27, 1911	137	335	96	218	48	10
June 27, 1911	328	464	246	421	50	121
July 29, 1911	36	36	43	46	73	36
August 31, 1911	0	0	1	0	4	2
September 14, 1911	0	0	0	0	0	0
Grand total	612	883	437	714	175	169

Percentage of deaths: Carabaos, 71; cattle, 80.

Señor Narciso Pecson, the municipal president of Anda—the only municipality on the Island—was in the saddle nearly all of the time, explaining to the people the reasons for the quarantine, and also helping to enforce it. His personal in-

fluence and his work in the field were of great assistance, and in commending him it is safe to state that he is one of the most energetic and efficient presidents in the Archipelago and has at heart the uplift of his people.

The people as a whole were in favor of the quarantine and did all in their power to make it a success by building fences, building and guarding detention corrals, and doing police duty *without pay*.

The twenty Constabulary soldiers of the First Company of Pangasinan are to be commended for their eagerness to help make the quarantine a success by aiding in the inspection of animals, and for their efficient maintenance of day and night patrol of infected districts.

REVIEW OF THE REPORT OF THE FIBER EXPERT ON JAVA AND THE SURABAYA FIBER CONGRESS.

By R. J. FISKE, *Agricultural Inspector.*

Mr. M. M. Saleeby, fiber expert of the Bureau of Agriculture, who represented the Philippine Islands at the Surabaya Fiber Congress held at Surabaya, Java, from the 4th to the 8th of July, and who afterwards made an original investigation of agricultural conditions in the island, returned to Manila on August 25.

The Surabaya Fiber Congress was called to discuss matters of interest pertaining to the important world fibers. Delegates from many countries were present, the Philippines being represented by Mr. Saleeby, while the United States sent Prof. Lyster H. Dewey, of the United States Department of Agriculture.

Mr. Saleeby left Manila June 13 and arrived in Surabaya on the 27th. From this date until July 3 his time was spent in installing the Philippine exhibit of fibers, which was the largest at the congress.

The congress was held in a special hall adjoining the division set aside for the machinery exhibit. This hall was provided with a complete collection of charts, specimens, statistics, and illustrations which proved extremely helpful in satisfactorily discussing and demonstrating the different phases of the fiber industries.

Three classes of persons attended the congress: Members of the Netherlands India Agricultural Association, who were all managers of extensive estates and therefore men of large experience; scientific men, mostly experts of the department of agriculture for the Dutch East Indies, and also representatives of foreign countries; and manufacturers, business men, and mechanics, who were familiar with the cleaning, baling, marketing, and market requirements of commercial fibers.

Agave fibers (Yucatan sisal, true sisal, and maguey) were discussed on the first day of the congress, July 4. It is believed

that the cultivation of maguey in the eastern tropics will greatly increase, owing to satisfactory environment and the superior quality of its fiber.

The only serious disease of the agaves so far discovered in the eastern Tropics is the blackrot of Java, introduced from the Bahamas, or from Hawaii, which attacks the true sisal plants only, leaving the maguey uninjured. Agave diseases are much more numerous in tropical America, to which the plants are indigenous. Probably the most serious disease in the Bahamas is bacterial in origin. A comparatively new disease is one forming nodules on the fiber, described by Dr. A. L. Herrera, of the department of Fomento, Mexico, under the name *Elasmodiophora agaves*, and not yet known to exist outside of Mexico. In Java it was found that both lightning and intense heat affect the leaves.

The following are the conclusions reached by the special committee reporting on agaves:

The cultivation of *Agave sisalana* and *Agave cantala* in Java is not profitable on lands that do not permit of cheap transportation of the raw material (leaves), nor is it profitable where, owing to poor soil or a cool climate, the production falls below 500 kilos of dry fiber per bouw ($\frac{1}{10}$ hectare). It may be profitable on lands with little humus, providing they are well drained and not more than 350 meters above sea level. The cultivation of agaves is most profitable on estates where they are not the only crops grown, but sisal is not suitable for interplanting with other crops. Low growing, nonclimbing leguminous crops between the rows of sisal is beneficial. A central factory is to be desired, while a system of local factories in different parts of a large estate is only permissible where the topography does not admit of cheap transportation. If the estate produces more than 200 tons of fiber, automatic cleaning machines are necessary.

Plantations of less than 280 hectares are not profitable if sisal is the principal crop while 140 hectares is the minimum for profit if a secondary crop.

The committee on matting straws reported that the manufacture of cheap articles from these materials is more profitable than articles of luxury, as the market is wider and a larger quantity may be made for export. However, the production of either class of articles was not encouraged as the profit was too small, but if machinery could be used the industry would become much more profitable.

The committee on abacá reported as follows:

The cultivation of abacá on land where the raw material can not be cheaply transported is not profitable unless small portable machines or hand cleaning is resorted to, nor is it profitable in locations where the production falls below 1,000 kilos per hectare.

Abacá in Java requires a loose soil rich in humus and not more than 500 meters above sea level. Under favorable conditions the production may be as much as $2\frac{1}{2}$ tons of dry fiber per bouw per year (3,570 kilos per hectare).

It is desirable to combine abacá with other crops on the same estate but interplanting of other crops with abacá is to be discouraged.

A central cleaning plant is much more profitable on large estates than several local plants unless the nature of the land is such that the cost of transportation of the raw material is prohibitory.

If abacá is to be the principal crop the estate should contain at least 175 hectares, although, if secondary, 35 hectares may be profitable.

The expenses of harvesting, cleaning, transporting to port of shipment, freight, commission and selling, total ₱140 per metric ton. The value in the Netherlands may be placed at ₱228 per ton, and the profit at ₱88 per ton. The net profit of a minimum production of 1,000 kilos per hectare is 5 per cent; with a production of 2,000 kilos, 20 per cent.

Java jute (*Hibiscus cannabinus*) was discussed on the 5th.

The climate of central and east Java, and on the greater part of the neighboring islands, is suitable to jute cultivation. Only ordinary rainfall is required and slight variations in temperature do not seriously affect its growth. The soil must not be very poor nor should it be particularly rich but must be very well drained, for an excess of moisture left standing on the soil will injure the roots in a comparative short time.

The consensus of opinion was that Java jute can not profitably be grown by European planters until satisfactory machinery for cleaning the fiber has been put on the market.

Kapok is a good secondary crop for the native farmer but European planters making it their principal crop will usually find the profits small. It is recommended that it be combined with cacao, coffee, etc., or with cattle raising.

The consumption of kapok is increasing all over the world, but officials in other tropical countries are encouraging its production so that future competition may be expected.

Experiments have lately been made by some planters in Sumatra to raise cotton as a catch crop with rubber during the first two years, for the purpose of helping to defray the expenses of the rubber plants while young. The results seem to be in favor of this method, and it was shown that at least 11½ piculs of cotton can be produced on every hectare within a period of four and one-half months. Some rubber companies have already decided to plant cotton on the whole of the area planted in rubber.

Cotton lands should not be permitted to be overrun with "alang alang" (cogon).

The prospects for European cultivation of cotton are not unfavorable, especially if carried on in connection with other crops, i. e., mixed farming.

The three days following the close of the congress were spent

in Surabaya and vicinity where a visit was made to the Boedoe-ran and Tangoelangin sugar mills and plantations.

Sugar is by far the most important agricultural product of Java. Immense areas of level land are planted to it to the gradual exclusion of rice; the eastern and central residencies owe their prosperity to this industry. Large numbers of modern sugar mills and refineries handle the immense crops and during June and November are kept busy day and night.

Plowing, planting, cultivating, and harvesting are all done by hand. The final operations of milling, refining, and transportation, however, are carried on by the most up-to-date methods, in which modern machinery takes the place of manual labor.

The Kedawoeng and Karang Genang maguey plantations were visited. On the first the plants are set out 3 by 1 meters but on the latter the distance is less, the superintendent believing that the closer planting reduces the cost of cleaning more than the difference in the yield. The leaves are harvested three times a year after the fourth year, but not more than ten are cut at one time; between the third and fourth years, however, only ten leaves are taken from one plant, and this is done in not less than two cuttings. Three raspadores are used on the first plantation to extract the fiber while on the second a Prieto machine, Irene No. 21, supplemented by two raspadores, is sufficient. It is not unusual to hear of 2,000 laborers on one plantation while on some of the larger plantations 10,000 men are employed. Wages are very cheap and ordinarily do not average more than ₱0.25 to ₱0.35 per day.

In summing up the coffee situation, Mr. Saleeby says that the cultivation of the Robusta species is increasing at the expense of the Java and the Liberian. The Java and Liberian coffees are liable at any time to be completely destroyed by diseases against which all efforts have proved futile. So far no serious diseases have attacked the Robusta variety although probably as it becomes more widely cultivated some disease will develop. However, Robusta coffee is only planted as a catch crop with rubber or other staple crops, which insures the planter against overproduction and materially reduces the cost of bringing the rubber to bearing.

The Robusta begins bearing from the second year up, insuring a good crop from about the third year. In east Java, where the plant grows best, several plantations have announced a crop of 28½ piculs per hectare. The average yield on the estates visited was 7 piculs per hectare, for plants between three and four years old.

The price for Robusta coffee is, as a rule, only 10 per cent less than that paid for the Liberian. This is considered very high and if the price is maintained its production will probably increase. The present Amsterdam quotations are ₧28 for Robusta and ₧32 for Liberian, per picul (63.25 kilos).

The rubber boom, which swept over the Federated Malay States in 1904 to 1906 and which struck Java about two years later, resulted in large areas of rubber being planted, capital coming from Holland and other parts of Europe as well as from Java. So large are the plantations in Java and the neighboring islands of the Dutch East Indies that rubber promises to be second only to sugar, and as all the work of caring for a rubber plantation must be done by hand the labor problem will soon be acute, even in densely populated Java, with the result that many of the minor industries will probably die out as the cost of the labor will thereby increase to a point above that at which they are profitable.

But two species of rubber are cultivated in the island, Pará (*Hevea braziliense*) and Indian rubber (*Ficus elastica*).

Clean cultivation is generally practiced although the interplanting of vines which closely cover the soil is gradually coming into favor. Pará trees five years of age yield on the average 2 pounds per year, some trees yielding as much as 3 pounds. Ficus trees, while growing more rapidly and being hardier, are best adapted to inferior soils where less care and attention can be given them as their yield is less than the Pará.

The rubber industry under favorable conditions is one of the most profitable agricultural undertakings at the present time. However, many companies have failed because the promoters, either in good faith or from obvious reasons, have figured out fabulous profits, on paper.

The rubber brokers, as well as managers of large rubber estates in Singapore, who were interviewed on the subject seem to concur in the belief that an oversupply of the market is to be feared and that a great drop in prices will take place during the coming year. They went so far as to say that they believed it will only be a question of a few years when the price will fall to ₧1 per pound. At such a price, they further stated, no oversupply will ever take place owing to the great number of uses to which rubber will be put, and from which it is now barred by the excessive cost. This does not mean that the present rubber companies in the East will be doomed. Indeed, the largest and most stable have started with the above situation of the rubber industry clearly in mind, and have calculated their profits on this basis.

This broad and rational view of the rubber industry is based on actual figures, and it must be borne in mind by all prospective rubber planters in the Philippines. While large dividends have been paid by *some* rubber companies, even in excess of 100 per cent, this can not continue for any length of time, besides which the cost of production here in the Philippines is considerably higher than in any other of the rubber countries in the East. However, even with the price at ₱1 per pound, rubber is said to give between 30 and 50 per cent dividends, providing the industry is carried on under favorable conditions and great care is given to its different details.

The planting of tea is made from seed, which is generally set out at a distance of 1 by 1½ meters. No shade trees are planted between the rows, and the field must be kept clean from all weeds or undergrowth. Women and children are continually engaged in harvesting the leaves, which may be done at eighteen months from planting, each plant being gone over every eight or ten days. Usually three or four fresh leaves are taken from each shoot. The cost of producing, packing, and marketing is usually estimated at ₱0.15 to ₱0.20 per pound. At the latter figure a conservative estimate per hectare is ₱300; according to the lowest estimate of Java planters the net income from a hectare is 25 per cent higher than the above.

The hat industry is a very important one in Java. The work is all done by hand, and machines are only used in blocking and finishing those hats intended for the local European market. The hats for export are all made by the natives in their homes. All the hats made by the natives and the greater part of those made at the factory are either ordinary bamboo or pandan hats. Up to a year ago the demand from Europe and the United States was exclusively for bamboo hats, but lately the demand for pandan hats has rapidly increased in preference to those of bamboo. The demand is restricted to the cheap coarse grades of both kinds. The natives of Java can not turn out the fine grades of hats that are made here in the Islands, but it appears that they may be relied upon to work more steadily and turn out hats at a much lower cost.

The demand for bamboo and pandan hats for ladies has lately been increasing. The hats are now required to have a very wide broad brim and Mr. Petit-Jean (manager of a hat factory west of Batavia) is finding it difficult to meet the requirements, owing to the fact that the fiber required is often longer than the space between the culm of the bamboo. The natives of Java evidently can not join the ends of the fibers in such a manner as to leave

no trace of the joint, as is done by the hat makers in the Philippines. With the pandan hats no such difficulty is encountered.

Mr. Petit-Jean is also turning out good "Panama" hats made from fiber grown on his plantation near Buitenzorg. This plantation of Panama hat plants (*Carludovica palmata*) is flourishing, and the fiber, or rather the young fresh leaves produced, compares very favorably with the "Panama" fiber of Porto Rico and Central America.

APPENDIX.

Mr. Saleeby brought back with him the following plants for propagation in the Philippines: 34 palms, 2 trees, 2 pandans, 14 large and 20 small shrubs, 8 vines, 43 herbaceous annuals, and over 100 miscellaneous seeds and plants.

A REVIEW OF THE SCOPE AND METHODS OF TROPICAL VETERINARY ENTOMOLOGY.¹

By M. B. MITZMAIN, *Entomologist*.

We feel justified in claiming for veterinary entomology a clearly defined branch of science since it holds on its records the earliest of the clearly demonstrated cases of the transfer of disease by insects, namely, the transmission of Texas fever by cattle ticks. Professor Novy says:

The recognition of the part played by the anopheles mosquito in the transmission of disease constitutes one of the brilliant achievements in science, and we must not forget that this result was largely rendered possible by the equally remarkable demonstration of Smith and Kilbourn that the Texas fever of cattle was spread through the agency of ticks.

Sir Lander Brunton once made the remark in an address before the London School of Tropical Medicine that the study of many of the important diseases of the Tropics was fast becoming narrowed down into a study of the insects which disseminate them.

The various scientific expeditions in the epidemiology of modern infectious diseases brings to light strongly the importance of medical and veterinary entomology. All of these researches have more or less centered about insect carriers as prime agents in the propagation of epidemics and epizootics. The importance of this division of science is emphasized by a mere reference to a few medical commissions, such as the Yellow Fever Commission in the United States, the Sleeping Sickness Commission in Africa, the English Plague Commission in India, and recently the International Plague Commission in China.

In order to obtain a comprehensive perspective of this branch of parasitology, I shall review some biological considerations in the attempt to orient in your minds the position which veterinary entomology holds in association with its zoölogical allies.

Origin of parasitism.—Modern parasites are restricted more or less completely to a particular host animal which would neces-

¹ Submitted February 27, 1911.

sitate the deduction that the parasite must have developed its habits after the existence of the host, and in consequence, that parasitism must be a recently acquired habit. This thought is further expressed by the study of the life history of the parasite—invariably the earlier stages point to a free-living existence. Perhaps the ancestors of the whole group of modern parasites were attracted to the waste food, offal, and excretions of certain animals. The search for food may have become simplified. They began living as messmates or commensalists or as scavengers. The association between the two species became close and eventually the life of parasitism was completed. This is also borne out by a study of the nearest allies of a given parasite, and of members of a given family of parasites in which the gradations from the free-living larva to the parasite may be traced.

Effect of parasitism on the host.—That an animal is parasitized does not necessarily involve the host in death nor even in great inconvenience, even though the parasite is actually living at its expense. The presence of a few bots in the stomach of a horse may not affect the horse in the least, nor would the presence of a few ticks on the body of an animal affect the animal, but with the multiplication of these parasites there will be increased inconvenience in both hosts. The presence of a few maggots in the fleshy part of the sheep's leg might cause little damage, but let these be in the nasal sinus or at the base of the brain, and the gravity of the situation will be greatly augmented. Thus the effect of parasitism on the host is dependent on the numbers and the position of the parasite.

Effect of parasitism on the parasite.—All parasites are more or less specialized in the direction of their habits, e. g., hairs; lice are horizontally flattened and are provided with clasping organs to hold fast to hairs, and both of these examples are wingless and have sacrificed ordinary means of locomotion. In the parasites generally, perhaps because of the ease in securing food, the sense organs are usually not strongly developed, as for example, the eyes may be wanting or very simple. The mouth parts may differ in the several groups dependent on their special adaptation, as in the fleshy mouth parts of the blow and house flies and in the piercing organs of the stable and horn flies. It is interesting to note that parasitic habits have resulted in the development of structural similarity. This is especially true in the clasping structures of the biting and sucking lice which belong systematically to two different orders, viz, the *Mallophaga* and the *Hemiptera*.

Internal parasitism.—There are no insects as far as is known which spend their entire life history in the form of internal parasites. There are, however, a number which pass their larval period (period of growth) within the alimentary canal or in the muscular tissues of higher animals. The best known representatives of this group are the bot flies and the warble flies, the former found mainly in the stomach of equines, while the latter are found in the muscle tissue of bovine and equine animals, rodents, and sometimes man. The damage done by internal parasites is of various kinds; loss of nutrition must be considered and secondly the irritation caused by the burrowing parasites in the muscles or by the attachment of hooks to the stomach lining for purposes of prehension must be taken into account.

External parasites.—The most important and most abundant external parasites of man and of the domesticated animal are found among the insects and arachnids. Very serious and often fatal results are due to this form of irritation, and the loss of blood due to an abundance of blood-sucking species must not be overlooked. External parasites may be either permanent or temporary. Among the permanent parasites are the biting and sucking lice, which are usually transferred from the host by close intercommunication with mammals while sleeping together, or closely huddled—in poultry generally while roosting. While these permanent ectoparasites are not so largely concerned in the direct transmission of infectious disease (direct infection), yet certain sucking lice are known to carry *Trypanosoma*. The temporary ectoparasites are the most important of all disease carriers, due to their frequent change of host—cropping off or flying away from one to another of the same or of a different species from the first host. It may be well seen that herein lies the danger of transmitting infectious diseases from animal to animal. These temporary ectoparasites are well represented by the fleas, bedbugs, ticks, and flies.

Importance of mouth parts.—When an insect becomes a pathological factor it is indeed significant to know the type involved and the mode of infection. It becomes evident that an insect possessing mouth parts capable of penetrating the skin of the higher animals must be looked upon as a possible carrier of blood infection, although it may in actual experience never attack such animals. If the insect is provided with mouth parts of the usual biting type it cannot relate to the transmission of affections introduced through the circulation, except by rare accident through a previously inflicted open wound. The mosquito would be harmless as far as malaria and yellow fever

are concerned if the mouth parts were of the mandibulate or biting type. These insects, together with certain other species such as the stable fly (*Stomoxys calcitrans*), tsetse flies, and ticks, are important because of the power which they possess of piercing the skin of the higher animals and introducing parasitic organisms directly into the blood. The house fly, on the other hand, cannot introduce organisms directly into the circulation because its mouth parts are not of the piercing type. These creatures are attracted by and often breed in excremental matter; if they are then attracted to the food of human beings, the pathogenic organisms from their mouth parts and feet are deposited thereon.

The actual measures of control are often quite dependent on a knowledge of the mouth parts.

In the study of medical entomology it is no longer applicable to divide the insects into only two groups as based on the mouth parts, namely, mandibulate or biting, and haustellate or sucking. This fact becomes clearer if it is considered that both the house fly (*Musca domestica*) and the stable fly (*Stomoxys calcitrans*) have sucking mouth parts and belong to the same family—*Muscidæ*, indeed, are systematically very closely related, yet from the standpoint of disease transmission they are widely separated. By virtue of the piercing structures composing the mouth parts of the stable-fly and horse-fly it relates them to direct infection while the house-fly and blow-fly proboscides, quite ineffective for piercing, relate them to indirect infection; they are not, however, of less importance as disease transmitters.

Relation of specific organisms to insect carriers and mode of transmission.—The transmission of most of the blood protozoa by means of insects is now a recognized fact, but the exact part played by such carriers is as yet, in many instances, not fully established. This is particularly true of the trypanosomes and spirochætes, and for that reason it will not be out of place to consider the several ways by which insects may convey disease organisms.

It has been customary for some years to speak of insects as passive and as active carriers, and these terms usually convey with them certain well-defined conceptions. Thus, in a general way, the passive carrier is looked upon as conveying bacteria, whereas the active carrier is connected with the transmission of protozoa. Now to what extent, if any, can the insect be utilized in distinguishing between the two groups, bacteria and protozoa?

According to Stiles there are two general rules with reference to parasites and disease, and these it will be seen are framed along the lines indicated above. He says: "The first rule, to

which at present a few exceptions are known, is that diseases which are accidentally spread by insects are caused by parasitic plants, particularly by bacteria. The second, to which no exceptions are as yet known, is that those diseases which are dependent on insects or other arthropods for their dissemination and transmission are caused by parasitic animals, particularly by sporozoa and worms."

It will be seen that the first rule deals with the passive or mechanical agent of transmission, and it is certainly true that until recently the bacteria were supposed to be about the only forms thus conveyed. The studies on trypanosomes, however, have shown that these protozoa are transmitted in essentially the same manner. Thus the supposition that the trypanosome of sleeping sickness multiplies in the gut of the tsetse fly which has not fed on infected animals has been shown to be erroneous. At all events it has been proven that the flagellates found in the stomachs of such flies are mere harmless parasites peculiar to the insect and are in no wise related to *Tr. gambiense*. The fact that the tsetse flies must bite within a few hours after their infective feed for an infection to result goes to show that such insects are mere mechanical or passive carriers.¹ For all practical purposes they may be compared to a syringe needle which has been dipped in infected blood. As long as the parasites remain alive on or within the needle it is possible to produce an infection by its use. The proboscis of the fly corresponds to the needle, and as long as living trypanosomes are present—and that time is measured by hours, or at most by a day or two—it is capable of causing infection. These facts apparently hold good for other trypanosomal infections, and hence, until it is shown that these organisms actually multiply within the insect host—as yet, apart from Schaudinn's work, which is open to serious question, there is no evidence that this occurs—the conclusion to be drawn is that such insects are mere passive carriers. Just as the house fly after soiling its feet or proboscis with typhoid bacilli is in a position to deposit such organisms on food and thus give rise to infection, so the biting flies in question seem to serve as mechanical agents in the transference of trypanosomes from one animal to another. It will be seen therefore that diseases which are accidentally spread by insects are not restricted to those of bacterial origin. In fact, from an epidemiological standpoint, the most important diseases thus conveyed are due to the trypanosomes. Hence the conception of a passive insect carrier to-day

¹ Only recently, however, Bruce has shown that reinfection in the tsetse fly takes place after long periods. Here the salivary glands are involved.

holds good for certain protozoa, even to a greater extent than for bacteria.

Turning our attention now to insects as active carriers of disease, some equally interesting deductions may be drawn. Notwithstanding the fact that it is possible experimentally to infect higher animals by injecting blood containing various plasmodia and most piroplasms, it is true that the natural infection by such protozoa invariably occurs through the agency of insects, such as mosquitos and ticks. It is a matter of common knowledge that the malarial organism in the mosquito passes through a complex cycle of development which requires some days and which must be completed before the insect is capable of transmitting the disease. A somewhat similar cycle has been recently worked out by Rogers for *Piroplasma canis*, and there can be no doubt that similar conditions obtain with hæmocytozoa other than those mentioned. It will be seen therefore that under natural conditions the transmission of these diseases is dependent on insects, and for this reason Stiles designates them as obligatory carriers. The artificial or accidental conveyance through wounds or by the injection of infected blood requires no special consideration, as such instances have no bearing upon the usual or natural mode of transmission.

Unlike the flies in trypanosomal disease where the part which they play is purely passive, mechanical, and temporary, the mosquito and tick in this second type of infections are to be considered as active, diseased, and permanent carriers. It is important to recognize that these insects are diseased, and with this idea in mind we may ask ourselves whether such a condition is brought about only by protozoa.

It will be seen that this question has an immediate bearing not only upon the nature of spirochætes and piroplasms but also upon the unknown germ of yellow fever and rinderpest. With reference to the spirochætes, more especially those of relapsing fever, it may be said that nearly all the facts which we have been able to gather go to show that these organisms are more closely allied to the bacteria than to any known protozoa. In one respect they approach protozoa, namely, in the fact that the tick-fever spirochæte (*Sp. duttoni*), and also that of chickens, is transmitted under natural conditions through the agency of a tick. The latter plays the part of an active host since it is capable of infecting weeks and months after its feed, and further, as in the case of Texas fever, the capacity to infect may be conveyed through the egg to the young tick. In other words, the tick and its offspring become diseased.

With transmission by contact or by inheritance there is strictly speaking no free or external life of the parasite, the organism passing directly from one living host into another, and this form of infection is often bound up with transmission by intermediate hosts. This mode would involve only a passive phase in the life history of the protozoan parasite, and in the majority of cases where the relation of parasites to intermediate hosts are fully made out the period in such a host involves some of the most important activities in the life of the parasite. Here are to be found some of the most perfect adaptations of means to an end that are known in biology; those forms which are not protected by resistant covering and where infection is brought about through the aid of an obligatory intermediate host are the most remarkable. The malaria organisms, for example, if sucked with the blood into the digestive tract of a mosquito of the genus *Anopheles*, are all digested save the conjugating forms, which are apparently endowed with some greater power of resistance than are the vegetative forms. But if the same parasites are taken into the stomach of a mosquito of the genus *Culex*, gametes, and other stages as well are alike digested; hence the various species of *Culex* cannot transmit malaria to man. Similarly with other forms of blood-dwelling parasites, each is apparently restricted to certain types of hosts, although in some cases a certain latitude in this direction is noted (*Trypanosoma brucei*, some species of *Babesia*, etc., may be carried by different hosts). The ultimate explanation of this resistance lies in the domain of physiological chemistry, and until this branch of biological science is more fully worked up the full significance of these adaptations will not be known.

In many of these cases the parasites undergo a definite developmental cycle in the body of the intermediate host, although in relatively few cases have the happenings in such cases been fully determined. In the cases of malaria organisms, *Herpetomonas*, *Leishmania donovani*, and some trypanosomes, the most important phases in the life history of the parasites—sexual reproduction, whereby the vitality is restored—are known to take place. In other cases, including the majority of trypanosomes and spirochaetes and most other protozoan disease-causing forms, little more than a sexual multiplication within the insect—the intermediate host—is known to occur.

In what manner are trypanosomes transmitted? Any blood-sucking fly feeding upon the blood of any animal suffering from trypanosomiasis would naturally transfer some of the hæmatozoa with the blood. That the presence of the living parasite in the

stomach of the fly by no means proves that the latter is capable of communicating the disease, and vice versa, if the motile organism is absent from the gut contents of the fly from an infected host, it does not prove that the insect is capable of producing the disease in a healthy susceptible animal. On the other hand, if the parasites remain alive in the alimentary canal sufficiently long, it is possible that some of them might find their way back into the proboscis and be subsequently introduced into the blood of another animal. It is also easy to suppose that the fly may convey the parasites directly from an infected to a healthy animal by flying to the new host immediately after sucking infected blood. This is doubtless true in surra transmission by the large horse flies.

At the present day, more than sixty species of trypanosomes have been described from different types of vertebrates and the greatest difference of opinion exists concerning their relationship and life history.

During the past decade our knowledge of the trypanosomal diseases has so grown by leaps and bounds that it may be truly said these hold at present a position of commanding interest.

The reason for this is not far to seek. It is not merely because six or seven of these diseases have been recognized in domestic animals in Asia, Africa, and South America. It is not wholly due to the discovery of a human form of the disease, but rather to the fact that the mastery by man of whole regions is called into question. The successful contest with malaria and yellow fever has now given place to the fight with trypanosomiasis, and upon the issue of this struggle depends to a large extent the destiny of tropical colonies.

It has been shown beyond any question that the transmission of sleeping sickness is effected by the bite of the tsetse fly (*Glossina palpalis*), and there is little doubt but that other species of this genus may also serve as transmitting agents. The ordinary biting flies (*Stomoxys*) and the mosquitos are supposed to be apparently incapable of spreading the infection. As in the case of nagana, the tsetse fly is able to convey the disease only within one or two days after it has fed on infected persons or on experimental animals. The fact that it is unable to produce an infection after two days indicates that the parasite does not multiply in the insect and does not pass through a life cycle such as has been worked out for the malarial organism.

The discovery a short time ago of flagellates in the stomach of tsetse flies led Koch and others to believe that *Tr. gambiense*

actually multiplied in the gut, but the studies of Minchin and his coworkers demonstrated that these organisms were harmless parasites peculiar to the fly and in no wise related to the human trypanosome. Investigators have been able to show that in the mosquito *Tr. lewisi* and *Tr. brucei* may live for at most two days and the exposure to the conditions prevailing in the stomach for a few hours is sufficient to so alter these organisms that they are no longer able to infect animals. The conclusion therefore is justified that the tsetse and other flies are mere passive and temporary carriers of the pathogenic trypanosomes, and this view may be accepted for the other insect carriers of flagellates. While it is true that no cycle of development has been worked out for *Tr. gambiense* in the tsetse fly it may be worth noting that an encysting form has been described by Minchin for *Tr. grayi*, the common parasite of *Glossina*. These observations are in line with those of Prowazek on the *Herpetomonas* of the mosquito.

The rôle of the mosquito in transmission of trypanosomiasis of mammals has not been definitely determined. Recent investigations have elucidated some important relations in birds. In the owl a blood parasite (*Halteridium*) has long been known, and Schaudinn has found that in the stomach of the mosquito (*Culex pipiens*) it becomes transformed into a trypanosome which presents three distinct types. Schaudinn regards these as male, female, and indifferent forms, and has been able to follow in detail the life history. They are inoculated into the owl by the bite of the mosquito to begin again the phase of the life history characteristic of that host.

The mechanism of transference to the warm-blooded host is extremely interesting, and as parasites of trypanosomiasis may possibly be transferred in the same way, it seems worth while to mention the details. *Culex pipiens* possesses esophageal diverticula which become distended with gas and may be termed "gas bags." This gas, carbon dioxide, is evolved by a sort of yeast-like fungus always present in the insect's stomach from traces of glucose present in blood, or—much more abundantly—from glucose present in the plant juices which the insect occasionally sucks. At the commencement of the act of suction, when the insect has its proboscis buried in the skin of its victim, its body undergoes one or more violent contractions which eject the contents of its foregut and "gas bags" into the skin. These contents comprise gas, saliva, and whatever particular matter is present—viz, yeast cells and sporozoites, the infecting organisms.

Once introduced into the owl the so-called indifferent forms enter the red corpuscles and transform into the *Halteridium* form. In this stage there is no multiplication such as takes place in human malaria; but at night, and also in spleen and bone marrow, these parasites leave the host cells to swim about as flagellate forms in the plasma, only to return by day. Six days suffice to bring these forms to the point of multiple fission which takes place in the plasma and produces many minute flagellate forms that reinfect the corpuscles with *Halteridia*. Later arise the sexual forms which are transformed as already stated in the stomach of the mosquito into trypanosomes.

At the present time nothing can be farther from settled than the happenings within the bodies of invertebrate hosts of trypanosomes, and much unfortunate controversy of an entirely unnecessary character has been filling the pages of medical and scientific journals.

Although mammalian trypanosomes were first observed and described by Lewis, in 1877, for *Tryp. lewisi* of the rat, and in 1880 for *Tryp. evansi* (the cause of surra in horses), little importance was attached to them as the causes of disease until Bruce, in 1894, demonstrated the connection between the disease nagana of horses in Africa of unknown etiology, and the tsetse fly diseases of horses. Very great importance attaches to the happenings within the body of the blood-sucking host, and here the matter is still in the whirl of controversy. Bruce states that in the hundreds of tsetse flies examined by him he has never found different stages of the parasite in the digestive tract and no indication whatsoever of migration into the body cavity of the fly. He regards the fly as a mere passive carrier of the protozoön, transmitting the disease during a limited period by inoculating the victim with trypanosomes adhering to the proboscis either inside or out. In this he is supported by Koch, Moore and Breinl, Novy, Roubaud, and a host of others, who note that the organisms disappear from the digestive tract of the fly within three or four days after feeding. Others, on the other hand, notably Gray, Minchin, and Tulloch, have found abundant multiplicative forms in the anterior part of the digestive tract, and encysted forms in the posterior part (proctodeum). These observers hold, and many others support them, that important developmental stages of *Tryp. gambiense* will yet be found outside of the host's body. That such an external life is obligatory for trypanosomes in general is disproved by the fact of direct transmission in the case of *Tryp. equiperdum*, where all of the developmental phases must take place in the mammal.

Another insect-borne disease, the epidemiology of which is rather obscure, is filariasis. This is a rather generic term for a number of diseases or for one disease which manifests itself in several ways, due to the presence in the body of the infected host of filaria or thread worms. All the species of the genus *Filaria* are parasites of other animals, living mostly in the stomach, intestines, sometimes in the connective tissue, and elsewhere. One species lives in the heart of dogs, another in the body cavity of horse, donkey, and ox; still another lives in the eyes of certain animals and negros. The young or larval filariæ live in the blood, but they finally lodge in the lymphatic glands and there mature.

It has been definitely proved that these filariæ actually live in the bodies of mosquitos and they are probably responsible for the dissemination of filariasis. The organism is taken into the alimentary canal of the insect with the blood sucked from the host affected. These filariæ work their way through the walls of the alimentary canal, and gather in the thoracic muscles. Here they live for some time. In two or three weeks they are ready for their further development in the blood and lymph of the animal host. Exactly how this transfer is made is not definitely proved as yet, although the mosquito bite is responsible for the transmission.

Manson suggested that the female mosquitos coming to any body of water to lay their eggs would often die there and their bodies fall on the surface of the water. As they disintegrated by rapid decay the larval filariæ in the thoracic muscles would escape into the water and live there until taken into the alimentary canal of animals drinking some of the water from the reservoir or pond.

Bancroft, on the other hand, believes that the filariæ are transmitted by the bite of the mosquito, having actually observed the migration of the filariæ from the thoracic muscles forward into the head and beak of the mosquito. It is certain at any rate that the mosquito is the actual disseminating agent of the disease.

A disease supposedly new to the Philippines threatens us to-day and bids fair to provide a problem for the morrow.

It is in the form of malignant jaundice in dogs, or canine piroplasmosis. It is common in various parts of China and India, and found endemic in native dogs in Madras, Hongkong, and other cities. These animals acquire tolerance and show but few symptoms.

The disease is caused by the blood parasite *Piroplasma canis* and the carrier is *Rhipicephalus sanguineus*, the common dog tick of India and China. It is one of the most widely distributed of the Asiatic ticks.

Tick infection is brought about hereditarily through the egg (proven by experimental infection) and stage to stage infection (judged from observations).

As in cattle-tick infection, which the disease closely resembles, the tick drops from its host after engorgement in each of its three stages, and whether in these it attaches itself to the same or different dogs is determined by chance. Reinfection by ticks is possible in a dog with a normal temperature and scanty parasites in the blood.

CURRENT NOTES¹—DECEMBER.

TOBACCO SEED CLEANING.

Mr. R. W. Rowe, superintendent of the tobacco station at Ilagan, Isabela, has recently made a trip through the tobacco districts of Isabela and Cagayan Provinces demonstrating the use of the Bureau of Agriculture's tobacco seed cleaning apparatus and looking after general matters connected with tobacco production in that region. This trip was made in company with Mr. Manus, of the Bureau of Internal Revenue, who has been, together with Capt. W. A. Stegner, of the internal-revenue service, coöperating for some time in the popularization of modern tobacco methods and the standardization of the output of the valley. During a brief trip Mr. Rowe cleaned seed for 1,712 persons; in some cases it was impossible to clean all the seed brought by the planters, but so far as possible a certain amount was cleaned for each applicant; the quantities cleaned varied from 2 to 30 liters of seed for each planter. No charge whatever was made for the work. The native planters have realized for some time the great benefit derived from planting only the clean, heavy seed from which the chaff and immature seeds have been winnowed, and the apparatus is now regarded as a necessary part of the outfit of the tobacco planter in the Cagayan Valley; in this connection the Bureaus of Internal Revenue and Agriculture are taking steps to introduce an improved style of seed cleaner, the price of which will be within the reach of even the poorer class of planters.

Through the municipal president the growers of each town were advised of the probable date of Mr. Rowe's arrival so that they could come in to have their seed cleaned. At these gatherings Mr. Rowe made it a strong point to urge the planters to raise a moderate amount of corn, rice, and vegetables so that in case of failure of their tobacco crop they would not be in danger of starvation; heretofore the condition of the families of the poorer class in that valley has been very precarious since

¹Original notes prepared by various members of the Bureau of Agriculture.

they depended very largely upon rice, purchased at exorbitant rates, for their existence. The Bureau of Agriculture is not only making strenuous efforts for better tobacco and more of it in the Cagayan Valley, but is gradually bringing about a *much healthier class of tobacco growers*.

A LORANTHUS AFFECTING CITRUS TREES.

In April of the present year near the town of Misamis, Mindanao, many of the citrus fruit trees, principally *Citrus decumana*, were found by Mr. D. B. Mackie, agricultural inspector, to be dying from the attacks of a parasitic plant of striking appearance. Specimens were sent to Mr. E. D. Merrill, the botanist of the Bureau of Science, who identified them as *Loranthus secundiflorum* Merrill. According to Mr. Merrill there are some twenty species belonging to this genus which are indigenous to our Archipelago, the particular one in question, however, being confined at present to the Island of Mindanao. It is a rather general parasite not showing any decided preference for the citrus varieties. Many of the species are very conspicuous on account of their masses of dark green foliage and their red, green, and yellow flowers.

While *Loranthus* is closely related to the *true* mistletoe (*Viscum*), both being parasitic on trees, the mistletoe sends its haustoria, or sucking roots, into the tissues of the host plant, while the *Loranthus* spreads its roots along the limbs and sends out runners which attach themselves to the branches at varying intervals.

In certain districts of the East, especially in parts of India and Assam, *Loranthus* is often a very destructive pest, where it is found on pear, peach, orange, and guava. In Assam, where it is found also on the tea plant, its foliage so closely approximates that of its host that the leaves of the parasite are often picked with the tea leaves, the presence of the parasite being noticeable only after the tea has been brewed through the bitter flavor imparted to it.

The fruit of these plants is rather small and oval in shape, the seed being surrounded by a very sticky substance by means of which it readily becomes attached to branches, etc.

According to observations in other countries birds are the principal agents of distribution, the larger passing them in the excrement while the smaller reject them from the mouth after consuming the pulp.

While this plant is not of great economic importance, yet with the advent of greater areas being brought under cultivation, it will in all probability become very troublesome.

COPRA DRIERS.

In view of the fact that the demand for good copra is slowly but surely increasing while the status of low grades is becoming more precarious it would seem that there is no time to be lost on the part of the producers in adopting some definite method by which they can secure a firm hold on the top of the market; that is, to standardize their output so that the buyers will be able to count upon getting A 1 material from them at all months of the year. In most of the copra-producing districts of the Philippines, however, it is almost impossible under present conditions to make even medium grades of copra during the rainy season, for without plenty of sunshine the "tapáhan" is a necessary evil until the producers decide to follow modern instead of antiquated practices. In several other countries, such as Samoa, and to a slight but increasing extent Ceylon, the great advantage of artificial driers is now recognized; strangely enough, however, in the greatest producing centers, like the Philippines, Indo-China, Malaya, and the East Indies, little or no attention has been given to this most important matter. It is a deplorable commentary on the progressiveness of the Filipino agriculturists that in this, easily the greatest copra producing country of the world, there are to-day in operation no copra driers which are turning out a smokeless article suitable for the higher grade copra products; however, Sr. Navarro at Pagsanjan has a huge concrete furnace (with no proper oven on top), and at least one rotary drier has recently been ordered from Europe; moreover several of the producers and dealers in copra are discussing the advisability of setting up modern drying apparatus. It remains for experiment to decide whether an oven with 3 or 4 trays, heated by steam or water pipes underneath, can be cheaply and easily set up on the average plantation. The Bureau of Agriculture is much interested in this matter and hopes to be able, in a few months, to advise the planters definitely in regard to this. The steam or hot-water system would have considerable advantage over the hot-air-pipe system because in the former case the copra could not be burned through carelessness or accident; the fuel, in either case, would be husks and shells, of course, and thus the running expense of such a plant would be practically nothing outside of the labor of charging and emptying the trays of the oven.

The Philippine coconut grower now has the chance of a lifetime to make himself as well as his product world famous.

MANGO PESTS IN CAVITE AND RIZAL PROVINCES.

In the June issue of the REVIEW an account was given by Mr. P. J. Wester, horticulturist of the Bureau, of a newly discovered mango pest in Cavite and Rizal Provinces. We quote from the article as follows:

Driving through Imus and adjoining barrios, the almost universally blackened and dead flowers on the mango trees at once attracted attention, and frequent stops were made for examination of the flowers. These were in most instances found to be covered with innumerable small wedge-shaped homopterous insects in all stages of development, able to fly or jump but short distances. * * * It is quite probable that this insect is identical with the so-called "mango fly" in India (three species of homoptera, *Idiocerus niveosparsus* Leth., *I. atkinsonii* Leth., and *I. clypealis* Leth.), which in certain years has been reported to reduce the mango crop to one-third of its normal amount in that country. In India these insects are present on the mango trees throughout the year, but hatch in great numbers every few years in the flowering season and destroy the bloom.

Specimens of these insects were forwarded to the Bureau of Entomology, United States Department of Agriculture, Washington, D. C., and advice has recently been had from Dr. L. O. Howard, Chief of the Bureau, that the insects are *Idiocerus clypealis* Leth., and *Idiocerus niveosparsus* Leth.

The same insects have since been found in Bulacan and some of the Visayas. The insect has not as yet been observed in Cebú.

HAT MAKING.

Hats are already made in considerable quantities in the Philippines and are excellent in their construction, but the material now at hand is such that they do not command the price they would were the material of better quality. Soil and climate in a large portion of the Archipelago are such that the Panama hat palm (*Carludovica palmata*) would succeed well here, and this plant introduced into the Philippines would furnish the wherewithal to make a hat of excellent quality in every respect, one that would command the very highest prices of all hats made of fiber, and we believe that the Filipino hat maker is fully equal in skill to her sisters in Panama, Colombia, and Ecuador. The Bureau of Agriculture is arranging for the introduction of seed of the Panama hat palm on an extensive scale, and it is hoped that before long this plant will be well introduced into the Philippines.

SERICULTURE.

Silk manufacture is an enterprise that would seem eminently well adapted to become a home industry among the Filipinos. For several years back attempts have indeed not been lacking by the Bureau of Science to establish the silk industry in the Islands, though so far with but little success. Lately the Bureau of Education has shown considerable interest in the encouragement of silk culture among the rural population in the Philippines, and large quantities of mulberry cuttings have been supplied to that Bureau by the Bureau of Agriculture.

Through its teaching force the Bureau of Education is undoubtedly in more intimate touch than other Bureaus with the people to whom sericulture would be of most importance, and it is hoped that its efforts may be successful. The home demand is already very considerable, silk having been imported into the Philippines in 1909 to the value of \$995,110.

VANILLA GROWING.

Notwithstanding an almost ideal climate for the production of vanilla and an abundance of cheap labor, no attempt has been made to grow this plant in the Philippines. Vanilla culture, in the pollination of the flowers and in the packing of the beans and curing them for the market, is to a very large extent dependent for its success upon close attention to details; this is work, light in itself, which can easily be performed by women and children, and the finished product would find a ready market. Believing that vanilla may profitably be cultivated here, the Bureau of Agriculture has arranged to introduce all cultivated species for the purpose of testing their adaptability to the Philippines.

APICULTURE.

It is remarkable, after thirteen years' occupation of the Philippines by Americans, that honeybees have not yet been introduced into the Archipelago, though honey was imported in 1909 to the value of \$4,956, and the great income derived from the apiaries in Hawaii, where beekeeping has grown to a great industry, is well known. The care of a few beehives is not arduous and the honey therefrom would be a source of comfort to the family table; in addition, the income derived from a few properly cared for hives would be far from inconsiderable. Recognizing the possibilities for this industry in the Philippines, the Bureau of Agriculture, through the Bureau of Supply, has recently ordered from Honolulu 6 bee colonies, together with the material necessary for their proper care and attention.

POP CORN.

Perhaps the newest industry in the Philippines is that of American pop corn. Though the Filipinos were familiar with a type of rice which pops, the American pop corn put out in the form of "Crispettes," or brickettes, of whole popped kernels moistened with white-sugar sirup, was a new food to them; beginning as a dessert confection it is now ranking as a real food and about a ton of corn is now made up weekly, most of which is consumed locally. Nearly all of this corn has to be imported from the Pacific coast at undue expense. The Bureau is beginning experiments to determine what varieties of pop corn are best adapted to Philippine conditions, and as soon as this matter can be worked out, the Filipino agriculturist will have another very profitable crop on his "waiting list," and it is hoped he will immediately take advantage of this excellent opportunity.

MONTHLY VETERINARY REPORTS—OCTOBER AND NOVEMBER.

By ARCHIBALD R. WARD, *Chief Veterinarian.*

Albay and Ambos Camarines.—The animal disease situation remains unchanged, there being no rinderpest.

Bataan.—Rinderpest infection is more widely disseminated than previously and six municipalities are now infected. As the force of the Bureau of Agriculture is not sufficient to combat the disease in this province the responsibility is still left with the provincial governor as it has been since April. A representative of the Director of Agriculture in the province with a very few assistants acts in an advisory capacity to the governor.

Batangas.—The municipality of Lobo is the only one known to be infected.

Bohol.—One municipality in this province is known to be infected.

Bulacan and Pampanga.—No material changes have occurred in these provinces. The provincial governor of Pampanga, who is responsible for the work in this province, is making a determined effort to control the disease.

Cagayan and Isabela.—One municipality in each province is now known to be infected—Solana and Ilagan, respectively.

Cebú.—The disease is widely disseminated in seven municipalities.

La Laguna and Rizal.—As anticipated in the previous report a vigorous search in these provinces revealed infection in one municipality—Pangil.

Leyte.—Infection is known only in the municipality of Sogod.

Oriental Negros.—Rinderpest is present only in Dawin and Bakong.

Pangasinan.—New cases are occurring only in Mangatarem and Bayambang. The Philippine Scouts are being removed from this province, merely enough being left on the southern border to give protection against infection from Tarlac and Nueva Ecija. The majority of the troops are to be temporarily removed from

quarantine service for the annual target practice, after which work will be undertaken in Tarlac and Nueva Ecija.

Tarlac.—Infection is still present in five municipalities and progress will be slow until sufficient Scouts are available to carry on the work. In the meantime a large portion of the employees of the Bureau of Agriculture will be removed from Pangasinan and will occupy the northern portion of Tarlac.

Zambales.—There is still some infection in four municipalities, though very restricted, as only six barrios are infected. The work in the province has shown a remarkable improvement during the present fiscal year, since at the beginning thirty-five barrios in five municipalities were infected.

General conditions.—The rinderpest situation throughout the Islands in general, shown by weekly reports, shows a satisfactory improvement. On July 3 seventy-six municipalities were infected; at date of writing, November 7, forty-five municipalities are known to be infected. The reported deaths per week have dropped from 149 on July 8 to 54 per week on October 28, the latest date for which accurate data are available.

It is becoming more and more evident that the work of the Philippine Scouts in the rinderpest campaign is being directed by their officers in such a way as to cause practically no ill feeling on the part of the stock owners. Official communications by the provincial governor of Pangasinan and by the lieutenant-governor of Siquijor attest to the fact that the people in these districts entertain the kindest feelings toward those who have been directly responsible for the details of the successful rinderpest campaigns carried on.

BOOK REVIEWS.

By O. W. BARRETT,

Chief, Division of Experiment Stations.

CACAO.

Cacao, a new manual on the cultivation and curing of cacao, by J. Hinchley Hart, late superintendent of the Royal Botanic Gardens of Trinidad, British West Indies, is a masterpiece of the kind and although based very largely upon the author's experience in the Islands of Trinidad and Tobago, the chapters on gross culture, harvesting, fermenting, and curing of the "bean" contain a large amount of excellent material applicable to all cacao-growing districts of the world. The late Mr. Hart was an authority on the classification of cacao types, having made a thorough study of this matter, both in Central America and the West Indies. The chapter on the agricultural chemistry of cacao contains some very interesting and important data on the constituents of the seed, pulp, pod, leaves, etc.; the question of chemical fertilizers is also gone into to some extent. There is also an interesting chapter on production with statistics of the various producing centers of the world, and a chapter on the mechanical appliances used on modern estates in handling the crop.

It is unfortunate that Mr. Hart never became converted to the "no-shade idea" which has been gaining ground rapidly in cacao-growing countries; to the last he advised the planters to "stick to the bridge which carries you safely over," that is, not to try any cutting out of shade in the plantations. This is probably the only adverse criticism which the book will receive from the average planter. The volume contains 64 illustrations and 301 pages, and is published by Messrs. Dockworth & Co., of London. It should be in the hands of every prospective cacao grower in the Philippines.

LES KOLATIERS ET LES NOIX DE KOLA.

The world has been puzzling for years over the question of kola varieties. It appears that some 3 or 4 species were introduced into the Tropics of both Hemispheres from the Gulf of Guinea region of West Africa; some of these species succeeded well in tropical America and a few have done fairly well in the Orient.

At last a work has been put before the public which settles once for all the various controversies about nomenclature of the kolas and, at the same time, gives the world a large amount of information concerning the production, commerce, uses, etc., of this very important nut. The title is *Les Kolatiers et Les Noix de Kola*, by Aug. Chevalier and Em. Perrot. It is published in Paris by Aug. Challamel, at the price of ₣8 (20 francs); it forms Volume 6 of the huge publication, *Les Végétaux Utiles de L'Afrique Tropicale Française*; it contains 500 pages and is well illustrated.

The principal author, M. Chevalier, has been engaged for several years in agricultural explorations in French West Africa; through his kindness the writer had the honor of introducing into the Western Hemisphere a collection of the very interesting tuberous mints which are grown for human consumption over a large district on the Guinea coast and which may become one of the great starch crops of the future. M. Chevalier ranks among the very best of the modern tropical agronomists and this present monograph on kola evidences his intense interest in and very thorough knowledge of the subject which has puzzled both botanists and commercial agents until now.

Kola may some day become a standard crop in the Philippines. Only recently has the commercial world begun to take a deep interest in the possibilities of kola production, but when we remember that about 20,000 tons of fresh kola nuts are actually produced annually (of which only some 1,000 tons reach Europe and the United States) the bulk being consumed in the various districts of the Sudan and West Africa—and even there the supply is far below the demand—we can readily understand the anxiety which M. Chevalier feels concerning the future status of his 5 distinct species and 10 good varieties of a possible rival to the 3 great beverages of to-day—tea, coffee, and chocolate.

MARKET REPORTS.

NOTES ON MANILA MARKETS FOR OCTOBER.

By KER & Co.

(Based on advices from New York, September 28; San Francisco, October 3; London, October 6, Hongkong, October 28; Iloilo October 28, Cebu, October 28.)

SUGAR.

Iloilo.—Coming crop is estimated at 125,000 tons. Further business has been done for January-March delivery basis ₱9 per picul first cost 88° but at the close market is easier.

Manila.—It is estimated that 1911-12 crop will reach 80,000 tons; some trifling business done for January-February delivery basis ₱7.75 per picul cost 88°.

MANILA HEMP.

Dull and we quote United States current ₱8.50 and United Kingdom ₱7.75 per picul first cost say £18/15/- and £17/5/- per ton f. o. b. Values of better grades also easier and we quote good current ₱15 per picul cost say £29/15/- per ton f. o. b.

Receipts at all ports for the ten months were 1,050,432 bales against 1,133,819 bales 1910 and 1,075,009 bales 1909 for the corresponding period.

COPRA.

Quiet at ₱12.75 Cebu f. m. s. and ₱11.50 Manila f. m. per picul first cost say £23/10/- and £21/5/- per ton f. o. b.

DISTRIBUTION OF PRINCIPAL PHILIPPINE EXPORTS FOR THE TEN MONTHS.

[January to October, 1911.]

Products exported.	United States.	China.	Pacific coast.	Great Britain.	Continent of Europe.	Australia.	Japan.	Singapore.
Dry sugar..... tons..	165,962	15,723	13,100	3,344	84,108	21,695	20,384	9,383
Hemp..... bales..	398,945	8,960	42,353	398,547	1,323,488	9,758	2,317	12,524
Copra..... piculs..	37,760	153,680	59,200	10,439	12,078	9,758	2,317	12,524
Cigars... thousands..	13,999	29,696	16,999	10,439	12,078	9,758	2,317	12,524

MANILA AND LONDON FIBER MARKET.*Receipts and shipments of Manila hemp.*

[Telegram from Manila to London, November 6, 1911.]

	1911	1910
Hemp receipts at:	<i>Bales.</i>	<i>Bales.</i>
Manila since January 1	883,815	887,194
Cebu, etc., since January 1	232,207	266,448
All ports since January 1	1,066,022	1,153,642
Shipments by steamer to:		
United Kingdom, cleared since January 1	414,083	417,719
Atlantic coast, United States, cleared since January 1	309,319	428,580
Pacific coast, United States, cleared since January 1	136,379	98,080
Continental ports, cleared since January 1	84,108	68,122
Shipments to:		
All other ports	61,208	
Local consumption since January 1	24,920	
	86,123	63,473
Loading steamer on the berth for:		
United Kingdom, about		32,000
Atlantic coast, United States, about		
Pacific coast, United States, about		7,000
Continental ports, about		
Shipments per sailer to Atlantic coast, United States, since January 1		20,660

LONDON FIBER MARKET.

The following prices for Manila hemp, sisal, and maguey were quoted by Messrs. Landauer & Co., London, September 27, 1911: ¹

Manila hemp.—Receipts for the week are cabled as 25,000 bales against 36,000 bales for the corresponding week last year.

There is no change to report in the position of fine hemp the value of good current remaining £33 to £33/10/—, with the higher grades on the usual basis.

Range prices.

Grades.	Spot and close by—		
	Per ton.	Per ton.	Per picul.
Best marks	40/- -43/-	₧400.00-₧430.00	₧25.00-₧26.90
Good marks	38/- -40/-	380.00- 400.00	23.75- 25.00
Good current	34/- -34/6	340.00- 343.00	21.25- 21.43
25 per cent over current	22/- -22/6	220.00- 223.00	13.75- 13.95
Fair current	20/- -20/3	200.00- 201.50	12.50- 12.59
Superior seconds	19/6 -19/9	193.00- 194.50	12.10- 12.16
Good seconds	19/3 -19/6	191.50- 193.00	11.97- 12.10
Fair seconds	19/- -19/3	190.00- 191.50	11.85- 12.97
Good brown	18/9 -19/-	184.50- 190.00	11.55- 11.85
Fair brown	18/9 -19/-	184.50- 190.00	11.55- 11.85

Sisal hemp.—In somewhat better demand, the price in New York having advanced to 4½ cents, equal to £20/15/- to £22, c. i. f. Europe. A few parcels on spot on this side obtainable at £20/15/- to £21.

Manila maguey fiber.—Quieter. Values £19 for No. 1, Cebú, £16 ordinary No. 1, £15 No. 2 and £13/15/-.

¹ These quotations are in pounds and shillings English currency per ton. One pound equals about 10 pesos Philippine currency. One ton equals approximately 16 piculs.

PRINCIPAL PHILIPPINE IMPORTS AND EXPORTS— SEPTEMBER, 1911.

.By the COLLECTOR OF CUSTOMS.

IMPORTS.

Articles.	Manila.	Cebu.	Iloilo.	Jolo.	Zam- boanga.	Bala- bac.	Totals.
Rice ----- {Kilos-----	19,021,829	3,929,617	2,768,009	331,250	485,290	408	26,536,403
----- {Value-----	\$783,175	\$139,750	\$97,775	\$15,870	\$21,829	\$20	\$1,058,419
Beef cattle ----- {Number-----	853	-----	-----	-----	-----	-----	853
----- {Value-----	\$24,352	-----	-----	-----	-----	-----	\$24,352
Eggs ----- {Dozens-----	234,152	108	200	63	-----	-----	234,523
----- {Value-----	\$25,978	\$13	\$24	\$7	-----	-----	\$26,022
Sugar ----- {Kilos-----	280,054	20,243	19,975	7,861	10,120	99	338,352
----- {Value-----	\$20,348	\$1,675	\$1,363	\$592	\$719	\$10	\$24,702
Coffee ----- {Kilos-----	122,389	747	2,839	341	2,773	-----	129,089
----- {Value-----	\$36,814	\$241	\$920	\$101	\$860	-----	\$38,936
Cacao ----- {Kilos-----	31,386	2,527	-----	-----	12	-----	33,925
----- {Value-----	\$9,467	\$710	-----	-----	\$14	-----	\$10,191

EXPORTS.

Hemp ----- {Kilos-----	5,839,644	2,776,629	354,200	18,724	-----	-----	8,989,197
----- {Value-----	\$569,741	\$273,283	\$35,000	\$1,665	-----	-----	\$869,689
Copra ----- {Kilos-----	15,785,878	3,895,121	9,975	126,014	207,346	915	20,025,249
----- {Value-----	\$1,235,784	\$358,477	\$1,040	\$11,981	\$17,322	\$60	\$1,624,664
Sugar ----- {Kilos-----	1,264,829	675,902	28,976,499	-----	-----	-----	30,917,230
----- {Value-----	\$74,511	\$44,200	\$1,598,155	-----	-----	-----	\$1,716,866
Cigars ----- {Thousand-----	12,068	-----	-----	-----	-----	-----	12,068
----- {Value-----	\$156,333	-----	-----	-----	-----	-----	\$156,333
Cigarettes ----- {Thousand-----	2,464	-----	-----	-----	-----	-----	2,464
----- {Value-----	\$2,628	-----	-----	-----	-----	-----	\$2,628
Tobacco ----- {Kilos-----	963,213	-----	-----	-----	4	-----	963,217
----- {Value-----	\$137,806	-----	-----	-----	\$5	-----	\$137,811

TEMPERATURE AND RAINFALL FOR AGRICULTURAL DISTRICTS IN THE PHILIPPINES.

By the DIRECTOR OF THE WEATHER BUREAU.

SEPTEMBER, 1911.

[Temperature and total rainfall for twenty-four hours beginning at 6 a. m. each day.]

Date.	Hemp.				Sugar, Iloilo.		Rice, Tarlac.		Tobacco.			
	Albay.		Tacloban.		Temperature.	Rainfall.	Temperature.	Rainfall.	Aparri.		San Fernando.	
	Temperature.	Rainfall.	Temperature.	Rainfall.					Temperature.	Rainfall.	Temperature.	Rainfall.
	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
1.	27.8		28.2		27.6		25.6	42.6	26.0	12.7	26	14
2.	28		28.5		27.3		27.8		27.6		28.4	
3.	28		28.2		26.6		28.4	2.8	28.3		28.7	
4.	27.8		28.6		26		27.4		27.2		28.8	
5.	27.9		27.9	3.8	25.8		28	3	28.4		29	
6.	27.8		26.5	27.4	25.8	.3	27.9	9.1	28		28.8	
7.	27.5	8.4	26.2		25.6	33	28.4	10.9	27.8		27.5	
8.	27.9	1.3	27.7		25.8	2.8	28.3		27.9		27.4	
9.	27.3	9.9	27.2		26.6	2.8	29		27.8		28	
10.	28.4		27	21.1	26.1	3.6	28.6		27.3		28.1	
11.	27.4	85.1	26.8	1.8	25.5	49.8	28.8		27.5		28.7	.3
12.	27.9	.5	26.8	1.5	26		28.7	3.6	27.1		28.8	
13.	27.7		26.9		25.6	28.2	29.8	4.3	27.4		28.6	.3
14.	25.6	.5	27.7		26.3		28.5		27.6		28.3	
15.	26.8		27.8	3.8	27.1		29.2		26.8	11.4	27.8	
16.	27.8	1	27.1	13	27.6	9.2	27	14	27	261.1	27.1	41.1
17.	27.6	3.8	28.6		26.9	28.7	28		24.1	24.6	26	90.1
18.	26.3	4.3	27.8		26.3	22.4	27.2		25.6	6.1	26.8	
19.	26.9	.5	27.6		26	6.9	27.2		26	.8	27.5	1
20.	27.5		27.6	1.3	27		27.2	12.2	26.7	12.8	27.6	
21.	26.3	71.1	26.1	18.5	27	.8	27.6	6.6	26.6	6.4	28.6	3.8
22.	26.9		25.9	20.8	26	2.8	28.6	29.2	26.9		27.2	.5
23.	27.4		26.6	17.8	26.2	.8	28.3		27.2		27.4	
24.	25.9	.8	26.9	.8	26.2		28.4		27	2.5	27.7	
25.	27.3	.8	27	3.8	26.4		29.4		26.7	19.8	28.2	
26.	27.6	2.6	28.9		26.8	1.8	28.6	1.3	27	21	28.2	28.4
27.	28.1	.8	29		28.2	22.4	25.6	22.9	26	52.8	25.7	75.7
28.	27.2	1.8	28.6		25	56.6	26	13.3	23.9	26.9	24.7	131.8
29.	26.7		27.5		26.6	10.4	24.8	54.1	24.9	1.8	25.8	54.3
30.	26.8		27.2		27.2		27	52.6	24.4	.2	25.4	23.9



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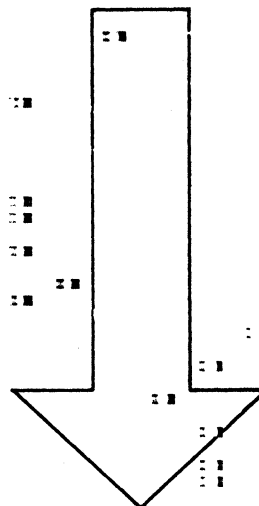
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